NELLCOR

SERVICE MANUAL

Oxinet® II Patient Monitoring System

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SECTION 1: INTRODUCTION

1.1 Manual Overview
1.2 Warnings, Cautions, and Notes
1.3 Intended Use of the *Oxinet II* Monitoring System
1.4 Description of the *Oxinet II* Monitoring System Equipment

1.1 MANUAL OVERVIEW

This manual contains information for servicing the *Oxinet*® *II* monitoring system. Only qualified service personnel should service this product. Before servicing the *Oxinet II* system, read the operator's manual carefully for a thorough understanding of system operation.

1.2 WARNINGS, CAUTIONS, AND NOTES

This manual uses three terms that are important for proper operation of the *Oxinet II* system: Warning, Caution, and Note.

1.2.1 Warning

A warning precedes an action that may result in injury or death to the patient or user. Warnings are boxed and highlighted in boldface type.

1.2.2 Caution

A caution precedes an action that may result in damage to, or malfunction of, the system or a component of the system. Cautions are highlighted in boldface type.

1.2.3 Note

A note gives information that requires special attention.

1.3 INTENDED USE OF THE *OXINET II* MONITORING SYSTEM

The *Oxinet II* system is a PC-based patient monitoring system for use in the hospital environment. It is designed to display, record, and store real-time physiological data for up to 30 patients on wireless systems (Radio-link), or 16 patients with the hard-wired system. This system gathers data from the Nellcor NPB-290, NPB-295, N-395, N-595, N-3000, N-3100, and N-3200 displays the data and stores information for future use at a central location. Physiological data available with this system includes SpO_2 pulse rate, respiration rate, heart rate, and noninvasive blood pressure (NIBP).

1.4 DESCRIPTION OF THE *OXINET II* MONITORING SYSTEM EQUIPMENT

1.4.1 System Overview

The major components of the *Oxinet II* monitoring system are the central station and the bedside stations. The *Oxinet II* system components are illustrated in Figure 1-1 and described in the following paragraphs.

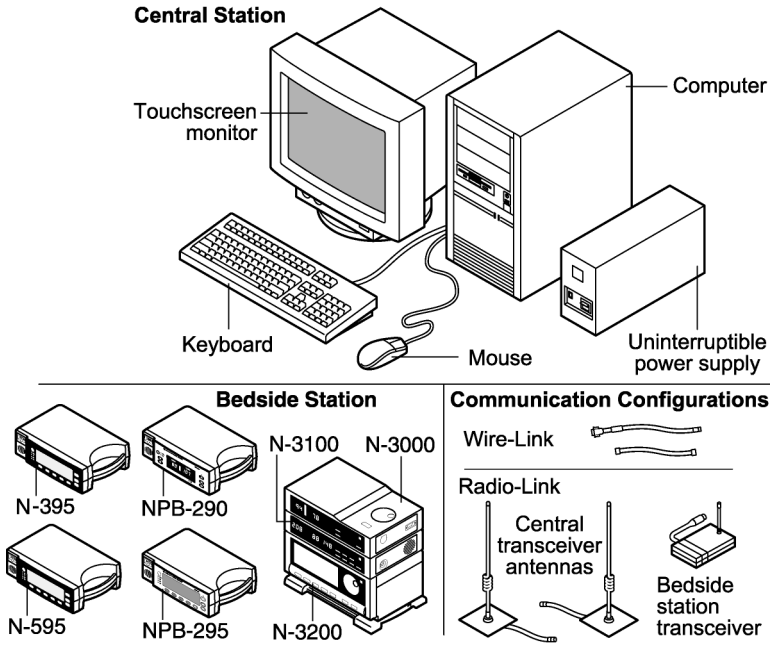

Figure 1-1: *Oxinet II* Monitoring System

Patient data is converted to a digital format at each bedside station and is transmitted through a radio-link or hard-wired to the central station.

1.4.2 Central Station

Refer to Figure 1-1. The central station consists of a computer, a monitor (touchscreen optional), a keyboard, a mouse, an uninterruptible power supply, an optional thermal printer, and an optional laser printer (not shown) supplied by your facility. These components are described in the following paragraphs.

1.4.2.1 Computer

The computer is the primary component of the central station in the operation of the *Oxinet II* system. Patient data from the bedside stations is processed by the computer for display on the touchscreen monitor. The computer works very much like a typical personal computer (PC). It contains a motherboard, a 3.5-inch floppy disk drive, a hard disk drive, a video controller circuit board, and circuits for interfacing with the keyboard and the mouse. The thermal printer (optional), touchscreen controller circuit board, soundboard, and central radio transceiver in radio-link units, or an I/O PCB, and expansion card in hard-wired units are contained in the computer. The computer is housed in a standard mini-tower enclosure.

1.4.2.2 Touchscreen Monitor

The *Oxinet II* system uses a 15- or 19-inch monitor with a color display. With a touchscreen monitor, the operator touches the face of the screen to initiate or control an *Oxinet II* system function.

1.4.2.3 Mouse

The mouse is used to move a pointer on the monitor screen to a desired location such as over a key, button, waveform, or on-screen help index topic. The mouse has two buttons. When either of the mouse buttons is pressed, it has the effect of pressing the key or button, or selecting the waveform, or selecting an on-screen help index topic that is under the mouse pointer. Positioning the pointer and clicking a mouse button is the equivalent of touching the face of the touchscreen monitor at the location of the key, button, waveform, or on-screen help index topic. The mouse does not have to be connected to the computer to operate the *Oxinet II* system. The function of positioning the pointer and clicking a mouse button can be performed by touching the face of the touchscreen monitor where the key, button, waveform, or on-screen help index topic is displayed.

1.4.2.4 Keyboard

The keyboard connected to the computer is a standard 101-key PC-type keyboard used to enter alphanumeric patient data. The keyboard does not have to be connected to the computer to operate the *Oxinet II* system. The operator can use an on-screen keyboard where on-screen keyboard keys are pressed by touching keys displayed on the monitor or by clicking the keys with the mouse.

1.4.2.5 Uninterruptible Power Supply

The uninterruptible power supply (UPS) provides operational power for approximately 30 minutes for the central station should AC power fail. This allows the system to be shut down in an optimal manner and avoids losing patient data.

1.4.2.6 Thermal Printer (Optional)

The thermal printer can be used to print data when an alarm condition has occurred, ECG or plethysmographic waveforms, and trend information. The thermal printer is housed in the computer.

1.4.2.7 Laser Printer (Optional)

An optional laser printer can be connected to the computer to provide printouts of patient data and system status data. The central station is not supplied with this printer. The printer must be provided by the facility. See the *Specifications* section for minimum laser printer requirements.

1.4.3 Bedside Station

Every bedside station includes an NPB-290, NPB-295, N-395, N-595, or an N-3000 pulse oximeter with an SPS or PSS power supply. An N-3100 monitor and an N-3200 can also be stacked with an N-3000 as part of the bedside station. The N-3100 monitor provides noninvasive blood pressure, and the N-3200 can provide waveform readout at the bedside. These instruments monitor and process patient parameters and convert the measured parameters to digital data that is sent to the central station. Bedside stations in radio-link systems also include a remote radio transceiver connected to the applicable monitor. Data is transmitted via the radio-link communication configuration or hard-wired directly to the central station. Refer to the NPB-290, NPB-295, N-395, N-595, N-3000, N-3100, and the N-3200 service and operator's manuals, detailed descriptions of those monitors.

Note: All bedside station equipment must be powered by AC power to communicate with the *Oxinet II* station.

1.4.4 Data Communication Configuration

1.4.4.1 Radio-Link

Radio-link communication can be used to send digital patient data from the bedside station to the central station for processing and display.

N-3000: The N-3000 radio-link communication configuration requires that the serial port for each N-3000 in the installation be configured in the EIA-232 format. At each bedside station, a remote transceiver with a built-in antenna is mounted on the N-3000. The serial port on the back of the N-3000 provides power for the transceiver. The transceiver will not be powered if the N-3000 is running on battery power.

Note: It will be necessary to reconfigure the serial port if the N-3000 is preset to provide a nurse call. Set the configuration switches of the N-3000 to EIA-232. Consult the N-3000 service manual for proper switch configuration. The baud rate must be set to 2400 for spread spectrum systems and 9600 for fixed frequency systems.

NPB-290, NPB-295, N-395, N-595: When using an NPB-290, NPB-295, N-395, or N-595 monitor for the bedside station the serial port setup must be set to protocol = OXINET. The baud rate must be set to 2400 for two-parameter spread spectrum systems. The baud rate must be set to 9600 for four-parameter spread spectrum or fixed frequency systems. An external radio transceiver with a built-in antenna is connected to the serial data communications port on the rear of the NPB-290, NPB-295, N-395, or N-595 pulse oximeter.

Note: All bedside station equipment must be powered by AC power to communicate with the *Oxinet II* station.

Fixed frequency or spread spectrum radio communication and baud rate are determined by software. Both systems broadcast in the 902 to 928 MHz range. Systems broadcasting only SpO_2 use 2400 baud. Systems with ECG or fixed frequency use 9600 baud. The central station contains a central radio transceiver and is connected to an antenna network of at least two antennas.

Note: Any system broadcasting ECG data will use the 9600-baud rate. If more than 10 beds are being monitored with ECG selected, the fixed frequency system must be used.

1.4.4.2 Hard-wired

An I/O PCB and an expansion card are used in hard-wired systems. Each PCB comes with four channels that are configured to accept RS-422 signals. An expansion card cannot be used without an I/O PCB. Each channel can be individually configured to accept either RS-232 or RS-422 signals. (For more information, see paragraph 2.5.3). A central station configured with two I/O PCBs and two expansion cards can provide a maximum of 16 channels. All hard-wired systems send data at 9600 baud. The RS-232 signal can be used for a maximum of 25 feet and the RS-422 signal can be used up to 4000 feet. Serial output data from the NPB-290, NPB-295, N-395, N-595, and N-3000 pulse oximeter must be

configured to match the inputs of the channels in the central station. Central Stations in hard-wired systems are configured for a baud rate of 9600.

Note: If the central station is being used with a hard-wired system, it may be necessary to reconfigure the N-3000 to the RS-422 format. Consult the applicable operator's or service manual of the respective monitor for instructions on changing the communication format.

Note: The central station cannot be configured with both radio-link and hard-wire communications at the same time.

1.4.4.3 Minimum Software Requirements

Links cannot be established with *Oxinet II* if the software does not meet the minimum software requirements. The minimum software requirements for monitors communicating with the *Oxinet II* system are as follows:

NPB-290: All versions

NPB-295: All versions

N-395: All versions

N-595: Software revision 2.4.6.0 or greater

N-3000: Software revision 3.0.0 or greater

N-3100: Software revision 2.4.3 or greater

N-3200: Software revision 1.4.1 or greater

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SECTION 2: EQUIPMENT INSTALLATION AND HOOKUP

2.1 General Information
2.2 Power Requirements
2.3 Central Station Site Selection
2.4 Central Station Antenna Location Selection
2.5 Hardware Installation
2.6 System Interconnect (Radio-link Systems)
2.7 System Interconnect (Hard-wired Systems)

2.1 GENERAL INFORMATION

Caution: To avoid corrupting patient data, exit to DOS before turning off the computer.

Before moving or installing your *Oxinet II* monitoring system, contact Nellcor's Technical Services Department, Nellcor Customer Service Engineering, or your local Nellcor representative.

This section provides general information on reconnecting your *Oxinet II* system after installation and after moving it.

Before moving a bedside station in a radio-link system, contact Nellcor's Technical Services Department, Nellcor Customer Service Engineering, or your local Nellcor representative to determine the optimum location for the bedside station. A site survey may need to be performed to ensure proper operation. Refer to the operator's and service manuals for the individual monitor being relocated.

2.2 POWER REQUIREMENTS

Oxinet II system power cords must be connected to an approved, grounded outlet capable of providing power for the *Oxinet II* system as indicated in the *Specifications* section. This outlet must be close enough to the location of the central station that only the power cord supplied with the uninterruptible power supply (UPS) is used and a power extension cord is not used.

Caution: For USA locations, do not connect any components of the *Oxinet II* system to an electrical outlet controlled by a wall switch.

2.3 CENTRAL STATION SITE SELECTION

When you are considering a location for the central station, you will need a location that is accessible to the operator where the monitor is in full view of all who will be looking at it. In addition to accessibility, you will need adequate counter space for all components of the central station that will be used. Table 2-1 lists the space used by each of the components of the central station.

Table 2-1: Central Station Component Space Requirements

Central Station Component	Counter Space Requirement
Computer	22.8 cm (9 in.) x 38.1 cm (15 in.) x 43.2 cm (17 in.) tall
15-inch Touchscreen Monitor	Depends on the monitor supplied with your system. Monitors are purchased from different manufacturers.
19-inch Touchscreen Monitor	Depends on the monitor supplied with your system. Monitors are purchased from different manufacturers.
Uninterruptible Power Supply	33.0 cm (13.1 in) x 9.0 cm (3.4 in.)
Keyboard	47 cm (18.5 in.) x 20.3 cm (8.0 in.)
Mouse (Typical mouse pad)	(9.25 in.) x 20.3 cm (8 in.)

In addition to adequate counter space, consideration will also need to be given to providing adequate ventilation space around the central station. There must be a minimum of 1.5 inches from the top, front, sides, and back of all central station components to any wall or other enclosing surface. Nellcor recommends that a minimum of 4 inches of space from the back of the computer be available for cables. Do not put the computer or the touchscreen monitor inside a cabinet or other enclosed space through which air cannot freely flow.

2.4 SELECTION OF CENTRAL STATION ANTENNA LOCATION

The central station antennas need to be a minimum of 6 feet apart and a minimum of 6 feet from the floor with their ground plates in the same horizontal plane. It is recommended that the antennas be attached to the ceiling with the antenna elements pointing down. The location of the antennas must accommodate an antenna cable run that does not exceed the amount of cable supplied with each antenna. The antennas should be as far away as possible from any wall or structure containing excessive amounts of metal that could interfere with the radio signal. Contact Nellcor's Technical Services Department or Customer Service Engineering for the optimal location of the central station antennas.

2.5 INSTALLATION OF HARDWARE

Hardware installation consists of placing the central station at the selected location and placing components for each of the bedside stations, and connecting the necessary cables and components to make the system operate properly as described in the paragraph 2.7, *System Interconnect*. Once the system is installed and hooked up, proper operation of the system can be verified by performing the procedures in SECTION 1: *Performance Verification*.

2.5.1 Installation of Central Station Hardware

Place the computer and touchscreen monitor at the location selected for the central station. The UPS can be placed in the same area as the computer and monitor or further away such that the supplied power cords can be connected between the computer and monitor and the UPS. The keyboard and mouse are not required for operation of the *Oxinet II* system. However, if these components are used in your facility, place them at the central station location. The exact placement of central station components is determined by the needs at your facility.

Facilities with multiple central stations on fixed frequency could experience problems with communication between a bedside unit and its central station. A synchronization cable can be used to eliminate communication problems. It is installed between the central stations to limit communication events to one station, at any given point in time.

2.5.2 Installation of (Radio-link Transmitters) Bedside Station Hardware

Bedside stations that are monitored by the central station are composed of NPB-290, NPB-295, N-395, N-595, and/or N-3000 pulse oximeters. Each bedside station contains a radio kit. The N-3000 is equipped with either an SPS or PSS power supply, or an N-3000 coupled with an N-3200, and a remote radio transceiver. An N-3100 noninvasive blood pressure monitor can also be part of a bedside station.

Remove the adhesive backing from the quick-lock strips on the remote radio. Position the radio with its cable hanging over the rear of the monitor, and press the radio down onto the top of the monitor.

Set up each bedside station as described in the *Oxinet II* monitoring system operator's manual.

2.5.3 Installation of (Hard-wired Systems) Bedside Station Hardware

Bedside stations that are monitored by the central station are composed of an NPB-290, an NPB-295, an N-395, an N-595, or an N-3000 pulse oximeter equipped with either an SPS or PSS power supply. An N-3100 noninvasive blood pressure monitor and an N-3200 waveform monitor can also be part of an N-3000 bedside station.

Channels on the I/O PCB and expansion card in the central station are configured to accept RS-422 signals. Each channel of the I/O PCB and the expansion card can be configured to RS-232. See Table 2-2. If an RS-232 signal is going to be used, move the jumper for the channel to be changed into the RS-232 position. The jumpers on the I/O PCB are numbered J1A through J4A. On the expansion card they are numbered J1B through J4B. Labeling on the PCB's jumpers will indicate how the channel is configured.

For wiring within the building, use Category 5 (EIA/TIA 568A) twisted-pair shielded cable, 24 to 26 gauge, terminated to RJ-45 female connectors on both ends. RS-422 can be used for distances up to 4000 feet and RS-232 can be used up to 25 feet. The pin outs are: one to one, two to two, three to three, etc, and are listed in the chart below. The shield must be grounded at all bulkheads.

Note: Installation must conform to local building codes.

Table 2-2: Hard-wire Cable Pin Outs

Pin	RS-232	RS-422	
1	No Connection	Transmit Data +	Twisted
2	No Connection	Transmit Data -	Pair
3	Ground	Receive Data +	Twisted
4	Transmit Data Output	Receive Data -	Pair
5	Receive Data Input	Request to Send +	Twisted
6	Request to Send Output	Request to Send -	Pair
7	Clear to Send Input	Clear to Send +	Twisted
8	No Connection	Clear to Send -	Pair

2.6 SYSTEM INTERCONNECT (RADIO-LINK SYSTEMS)

This section describes how to interconnect the central station for initial installation and after the central station has been moved. Refer to the *Oxinet II* system operator's manual for bedside station interconnect information.

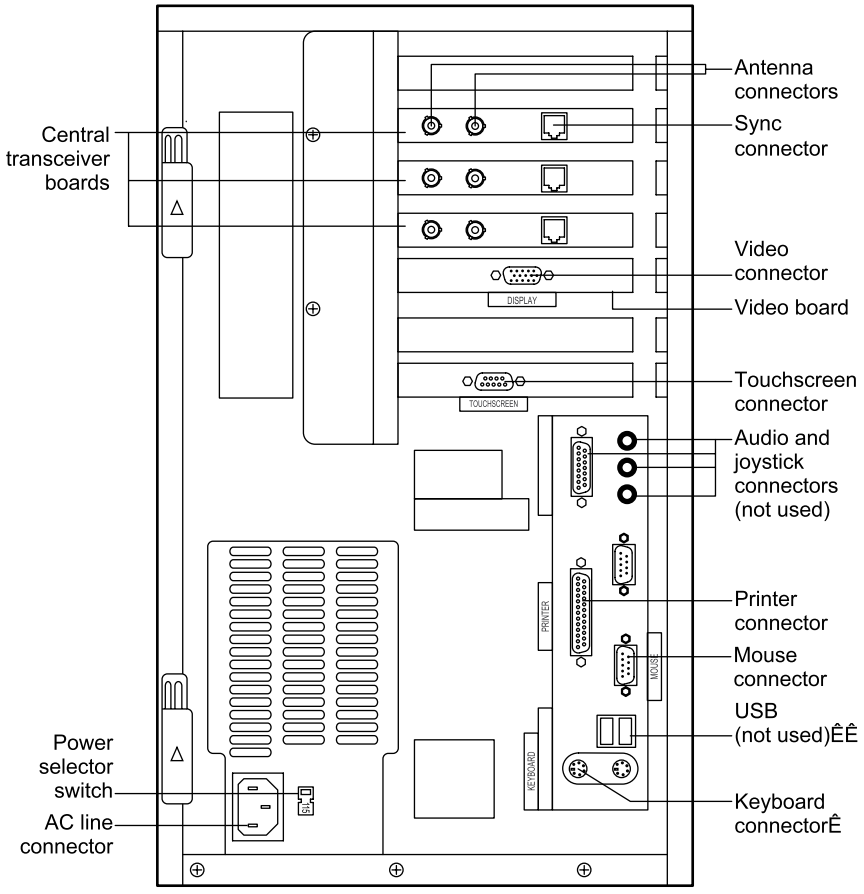

Figure 2-1: Computer Rear Panel Connectors (Radio-Link System)

Refer to Figure 2-1. Connect central station components using the following procedure.

1. Verify that the power selector switch is set to your facility's wall plug voltage.
2. If a mouse is used in your installation, connect the mouse to the connector marked “MOUSE.”
3. If a keyboard is used in your installation, connect the keyboard to the keyboard connector, which is the lower of the two connectors.
4. If your touchscreen monitor does not have the video cable permanently attached to the monitor, connect the end marked "MONITOR" to the monitor video connector.
5. Connect the other end of the video cable to the video drive connector marked “DISPLAY” on the computer.
6. Connect the end of the touchscreen control cable marked “TO INTELLITOUCH SCREEN” to the 9-pin connector on the back of the monitor.
7. Connect the other end of the touchscreen control cable marked “TO INTELLITOUCH CONTROLLER” to the touchscreen connector marked “TOUCHSCREEN” on the computer.
8. Connect one of the antenna cables to the connector marked “ANT. A” on the computer.
9. Connect the remaining antenna cable to the connector marked “ANT. B” on the computer.

(*Fixed Frequency Systems Only*)

10. If the Central Station has more than one central transceiver PCB, install a synchronization cable between the central transceiver PCBs as shown in Figure 2-1. Up to three central transceiver PCBs can be used. One of the PCBs will be designated Master and the others Slave. (Section 5, *System Configuration*, describes how to designate the master PCB.) Plug the end of the cable labeled M into the Master PCB and plug the S ends into the Slave PCBs.
11. A power splitter/combiner must also be used in systems with more than one central transceiver PCB. An incoming signal from the antenna is split into two or three signals. The outputs from this cable must all be connected to the same antenna input (all connected to A or all connected to B) on each of the central transceiver PCBs.
12. Larger hospitals may have more than one *Oxinet II* station. Each of the central stations may have more than one central transceiver PCB. Within systems like these, only one central transceiver PCB can be the Master. As with the cable in step 10, connect the end of the synchronization cable labeled M to the Master PCB and the ends labeled S to the Slave PCBs.
13. Multiple fixed frequency systems will require an isolation box to be installed between them. This will involve the synchronization cables and a synchronization pulse isolation box. The cables will be standard telephone wire with 6 conductors. Both ends of the cable will be terminated in a male connector. Both ends of the cable will be wired the same (one to one). See Table 2-3.

Table 2-3: Synchronization Cable Connections

Connector	Color
1	White
2	Black
3	Red
4	Green
5	Yellow
6	Blue

The pulse isolation box has two sides that can be identified by the number of connectors on each. The Master side will have only one connector. The Slave side will have 4 connectors.

The synchronization cable from the Master fixed frequency system will be plugged into the Master side of the isolation box.

The synchronization cables (maximum of 3) from the slave fixed frequency systems will be plugged into the Slave side of the isolation box.

2.7 SYSTEM INTERCONNECT (HARD-WIRED SYSTEMS)

This section describes how to interconnect the central station for initial installation and after the central station has been moved. Refer to the *Oxinet II* system operator's manual for bedside station interconnect information.

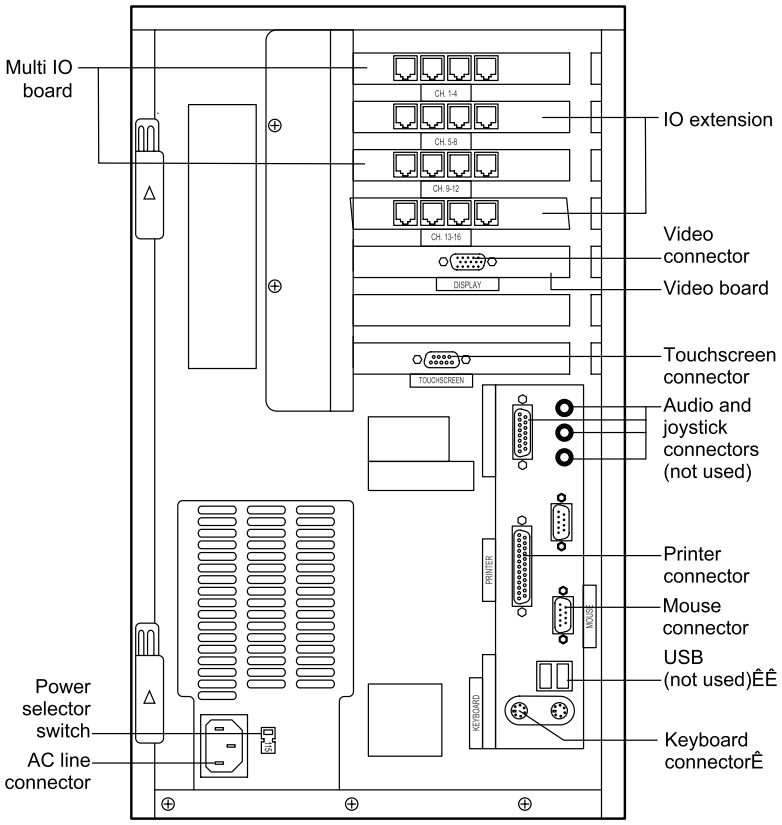

Figure 2-2: Computer Rear Panel Connectors (Hard-Wired Systems)

Refer to Figure 2-2. Connect central station components using the following procedure.

1. Verify that the power selector switch is set to your facility's wall plug voltage.
2. If a mouse is used in your installation, connect the mouse to the connector marked “MOUSE.”
3. If a keyboard is used in your installation, connect the keyboard to the keyboard connector, which is the lower of the two connectors.
4. If your touchscreen monitor does not have the video cable permanently attached to the monitor, connect the end marked "MONITOR" to the monitor video connector.
5. Connect the other end of the video cable to the video drive connector marked “DISPLAY” on the computer.
6. Connect the end of the touchscreen control cable marked “TO INTELLITOUCH SCREEN” to the 9-pin connector on the back of the monitor.
7. Connect the other end of the touchscreen control cable marked “TO INTELLITOUCH CONTROLLER” to the touchscreen connector marked “TOUCHSCREEN” on the computer.
8. Connect the cables from the bedside stations to the channels labeled 1 through 16.

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SECTION 3: PERFORMANCE VERIFICATION

3.1 Introduction
3.2 Required Test Equipment
3.3 Central Station Power-On Self Test
3.4 Electrical Safety Test

3.1 INTRODUCTION

This section discusses the tests used to verify performance of the central station and data communication interface with the bedside stations including the remote radio transceiver. To verify the performance of the NPB-290, NPB-295, N-395, N-595, N-3000, N-3100, and the N-3200 at the bedside station, refer to the individual service manuals for those monitors.

3.2 REQUIRED TEST EQUIPMENT

No special test equipment is needed to verify the performance of the *Oxinet II* system. An electrical safety analyzer is needed to perform electrical safety tests on components of the central station.

3.3 CENTRAL STATION POWER-ON SELF TEST

An internal power-on self-test is used to verify performance of the *Oxinet II* system following troubleshooting, replacement, and relocation of a central station component. When the central station is turned on, an internal power-on self-test is performed. Performance is verified when the Map screen is displayed after turning on the central station and communication links are established with all active bedside stations.

Note: When the central station is turned on, it may take several minutes for the data files to be updated before the Map screen is displayed.

3.4 ELECTRICAL SAFETY TEST

The safety tests for the *Oxinet II* and the NPB-290, NPB-295, N-395, N-595, N-3000, N-3100, and N-3200 monitors meet the standards of, and are performed in accordance with, IEC 60601-1 (EN 60601-1, Amendment 1, Amendment 2), and UL 2601-1, for instruments classified as Class 1 and Type BF and ANSI/AAMI Standard ES1. Technicians must be familiar with the standards applicable to their institution and country. Test equipment and its application must comply with the applicable standard.

The safety test required for the components of the central station is a ground integrity test. This test is to be performed on the computer, the touchscreen monitor, and the UPS.

Refer to the service manuals for the NPB-290, NPB-295, N-395, N-595, N-3000, N-3100, and N-3200 for safety tests for those monitors.

The ground integrity test verifies that the integrity of the power cord ground wire from the AC plug and connection with the chassis ground of the central station component being tested.

1. Configure the ELECTRICAL SAFETY ANALYZER as follows:

   Function: Ground Resistance Test

   Range: mΩ

2. Connect the central station component's AC power cord plug to the analyzer as recommended in the analyzer operating instructions.

3. Connect the analyzer resistance input lead to a metal contact on the outer case of the central station component. Verify that the analyzer indicates 100 milliohms or less.

This concludes the safety test for the central station.

SECTION 4: ROUTINE MAINTENANCE

4.1 Introduction
4.2 Cleaning
4.3 Installing Printer Paper in the (Optional) Thermal Printer

4.1 INTRODUCTION

The only routine service required is that which is mandated by your institution and local or national agencies.

4.2 CLEANING

Caution: Do not immerse any components of the central station or the bedside station in liquid. Do not use caustic or abrasive cleaners on any component of the central station or the bedside station.

To clean the central station components, dampen a cloth with a commercial, nonabrasive cleaner and wipe the exterior surfaces lightly. When cleaning the keyboard, avoid allowing liquids to get past the keys and inside the keyboard. To clean the remote radio transceiver at the bedside station, dampen a cloth with a commercial, nonabrasive cleaner and wipe the exterior surfaces lightly. Refer to the service manual for the NPB-290, NPB-295, N-395, N-595, N-3000, N-3100, and N-3200 for cleaning instructions for those monitors and for the SPS or PPS power supply.

4.3 INSTALLING PRINTER PAPER IN THE (OPTIONAL) THERMAL PRINTER

1. Open the door of the unit by pressing the Paper Eject Button. If the door does not completely open, pull it towards you.
2. Remove the spent paper core by pulling it towards you.
3. Place the new roll of paper between the two round tabs in the paper holder. Unroll about 4 inches of paper. If the roll is properly installed, the sensitive (shiny) side of the paper will be facing the printhead.
4. Align the paper with the pinch roller attached to the front door of the printer as shown in Figure 4-1. Do not feed the paper between the silver bar and the roller. Hold the paper against the roller as the front door of the printer is being closed.
5. To check the installation of the paper, verify that the paper can be pulled from the printer. If the paper will not move, repeat the procedure.

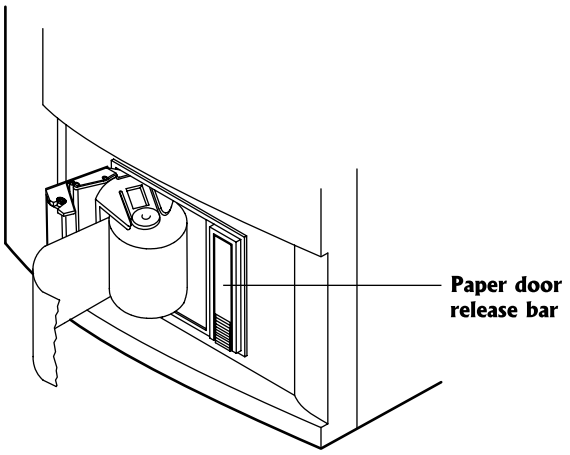

Figure 4-1: Installing Printer Paper

Note: The paper roll is 100 feet by 1.89 inches (30.48 meters by 48 mm)

SECTION 5: SYSTEM CONFIGURATION

5.1 Introduction
5.2 System Configuration

5.1 INTRODUCTION

This section describes how to use the System Level screens to setup and customize the central station for your facility. The paragraphs in this section can be used individually and in any order. When a system is shipped from the factory and turned on at your facility for the first time, an empty Map screen is the first screen displayed and a touchscreen monitor calibration is initiated by the system. Touch the screen where indicated to calibrate the touchscreen. You must access the System Setup screens and set up the Map screen before proceeding to another setup. No configuration or setup is required for the remote transceivers. Refer to the service or operator's manuals for the NPB-290, NPB-295, N-395, N-595, N-3000, N-3100, and N-3200 for configuration and setup of those bedside monitors as needed. If the system has already been set up when you enter the System Level screens, patient monitoring continues, and the bed buttons indicate alarm conditions.

5.2 SYSTEM CONFIGURATION

5.2.1 Accessing System Setup Screens

To access the System Setup screens and perform System Setup functions, perform the following steps.

1. Click the Setup function button. The Patient Setup screen will be displayed as shown in Figure 5-1.

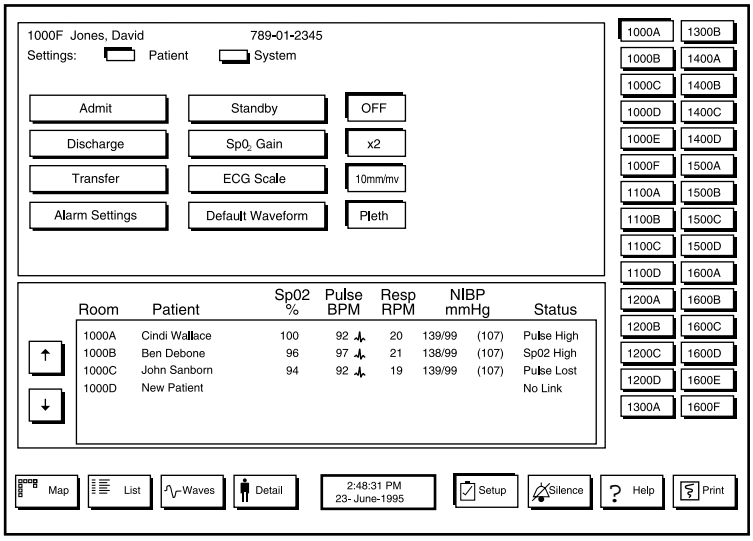

Figure 5-1: Patient Setup Screen

2. Click the System button at the top of the Patient Setup screen. The Password screen is displayed as shown in Figure 5-2. To exit the Password screen, click the OK button.

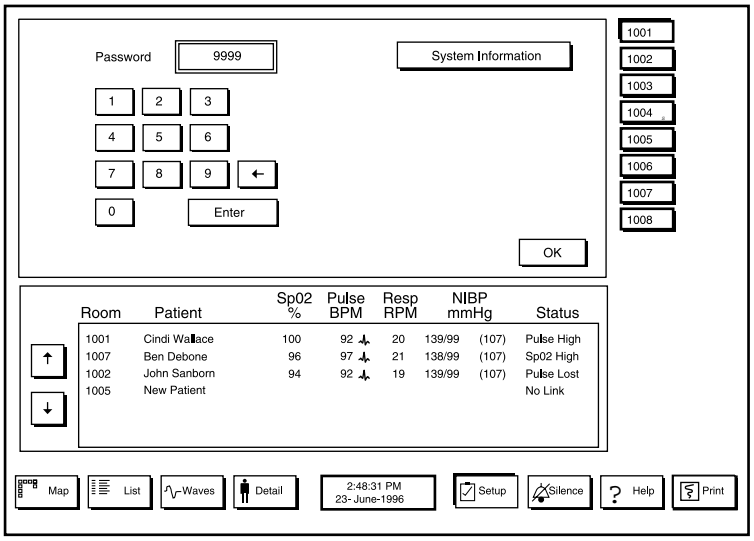

Figure 5-2: System Setup Password Screen

3. Click the number buttons or use the keyboard to enter the system password and click the Enter button or press the keyboard Enter key. The System Setup Function Select screen is displayed as shown in Figure 5-3.

Note: 9999 is the default system password. The system password can be changed, see paragraph 5.2.4, *Setting System Password*.

To exit the System Setup screens, click the OK button on the System Setup Function Select screen. The Password screen is displayed. To exit the Password screen, click the OK button.

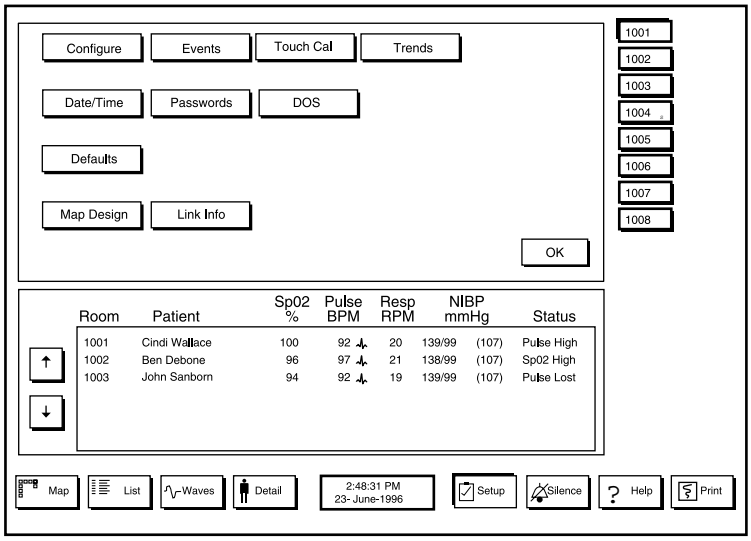

Figure 5-3: System Setup Function Select Screen

Note: If the system is using a radio-link, an additional button titled Transceiver is available on the System Setup Function Select screen.

5.2.2 SpO_2 Only (Spread Spectrum Systems Only)

The SpO_2 Only button is displayed only on Spread Spectrum systems. It allows for a choice between displaying only SpO_2 or displaying SpO_2, ECG, and Resp.

If SpO_2 Only is selected, the system can monitor 30 beds. The only available waveform is a Plethysmograph. Baud rate must be 2400.

When SpO_2, ECG, and Resp are selected, the system can monitor 10 beds. A choice can be made between a Plethysmograph and an ECG waveform. Baud rate must be 9600.

The SpO_2 Only button can be accessed only if there are no remote transceivers assigned. If radios have been assigned, the button will be displayed but it will not be active. Radios will have to be deassigned following the procedure outlined in paragraph 5.2.9.2.

Caution: The above step must not be performed while monitoring patients.

To access the SpO_2 Only button, press the Setup button at the bottom of the screen. Next, select System and enter the four-digit password (9999 if no number has been assigned), then press Transceiver. The screen in Figure 5-4 will be displayed.

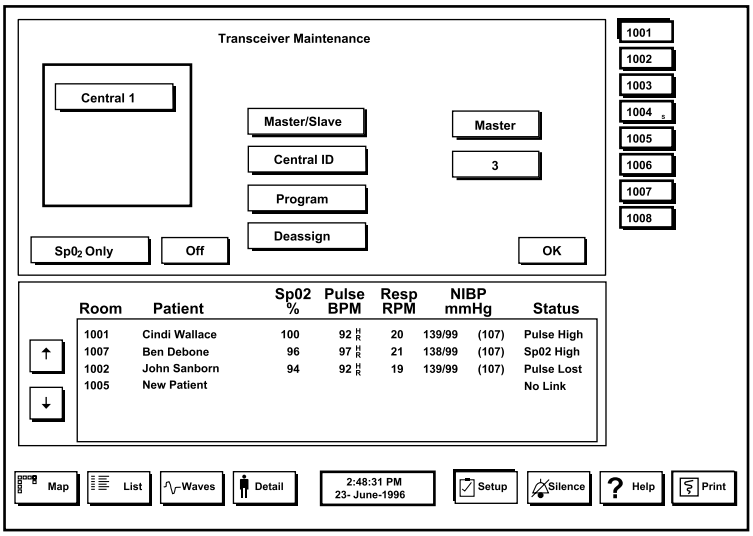

Figure 5-4: SpO_2 Only

1. Pressing the SpO_2 Only button toggles between On and Off.
2. Selecting On allows the system to monitor 30 beds, but only SpO_2 data will be displayed. Bedside stations must be set to 2400 baud.

   Note: If an ECG waveform is available from the N-3000, and On is selected, the waveform will not be displayed. All other available data will be numerically displayed on the screen.
3. Selecting Off will allow the system to display SpO_2, ECG, and Resp but only 10 beds can be monitored. Bedside stations must be set to 9600 baud.
4. When the selection has been made, click on the OK button.

5. Assign the transceiver as described in paragraph 5.2.9.

5.2.3 Designing the System Map Design Screen

When the system is first turned on after receipt from the factory, an empty System Map Design screen is displayed. The map is designed to look like the area covered by your *Oxinet II* system on the System Map Design screen. To display the System Map Design screen, access the System Setup screen, enter the password, and click on the Map Design button. The System Map Design screen will be displayed as shown in Figure 5-5.

Caution: Do not monitor patients while modifying the Map Design Screen.

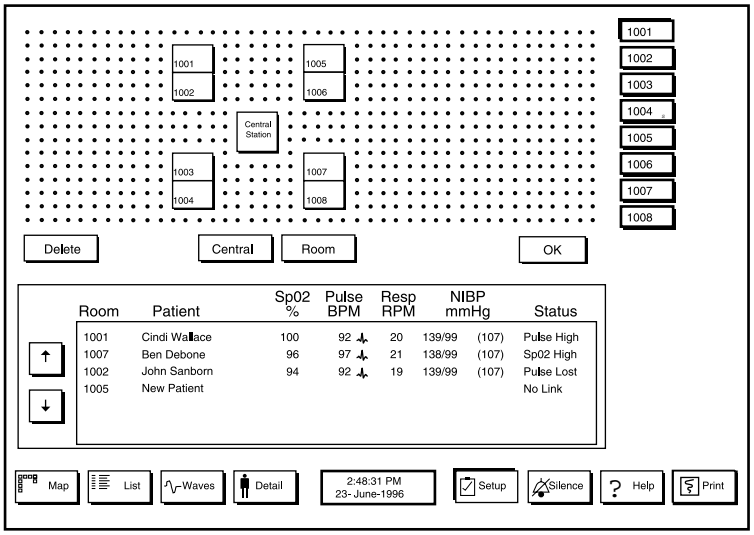

Figure 5-5: System Map Design Screen

Note: Before you begin designing a map for the first time avoid excessive "No Link" alarms by setting the system default standby status to ON. Refer to paragraph 5.2.7.5, *Setting System Default Alarm;* paragraph 5.2.7.1*, Setting System Default Channel Standby Setting*; and paragraph 5.2.7.2, *Setting System Default Channel SpO2 Gain.*

To place or reposition the central station box, click the Central button and then click the map at the location where you want the upper left corner of the central station box.

To place a bed box, click the Room button, then click the map at the location where you want the upper left corner of the bed box. An empty box will appear on the map. Click this empty box and the Enter Room ID screen is displayed. Use the attached keyboard or use the touchscreen monitor or the mouse and the on-screen keyboard to enter the bed number for that bed box. When finished, click the OK button or the Enter key, or press Enter on the attached keyboard.

On radio-linked systems the Enter Transceiver ID screen will be displayed. Enter the transceiver ID shown on the label of the bedside station remote transceiver for the bed being set up and press Enter, or press Enter if the transceiver ID displayed on the Central Station screen is correct. The Map Design screen is again displayed. After you have entered the transceiver ID for the bed, a bed button is displayed with the Room ID number, and also in the bed box on the Map Design screen.

Note: To enter a channel number on hard-wired systems see paragraph 5.2.10.

Note: As bed boxes are added to the Map Design screen, corresponding bed buttons appear and are arranged in ASCII ascending order. For example, a bed button with the number 10 would appear in order between a bed button with the number 1 and a bed button with the number 2.

Note: For a room containing more than one monitored bed, another bed box must be placed on the map for each additional monitored bed in the room.

To delete a bed box or to delete the central station box from the Map screen, click the Delete button and then click the bed box or the central station box to be deleted.

Note: A room that has a patient assigned to it cannot be deleted.

Note: To move a room on the Map screen to a new location, the room must first be deleted and then placed again.

When you are finished with the map design, click the OK button on the Map Design screen.

5.2.4 Setting System Password

To display the passwords setup screen, access the System Setup screens and enter the default password 9999. Click the Passwords button on the System Setup selection screen. The System Passwords Maintenance screen is displayed as shown in Figure 5-6.

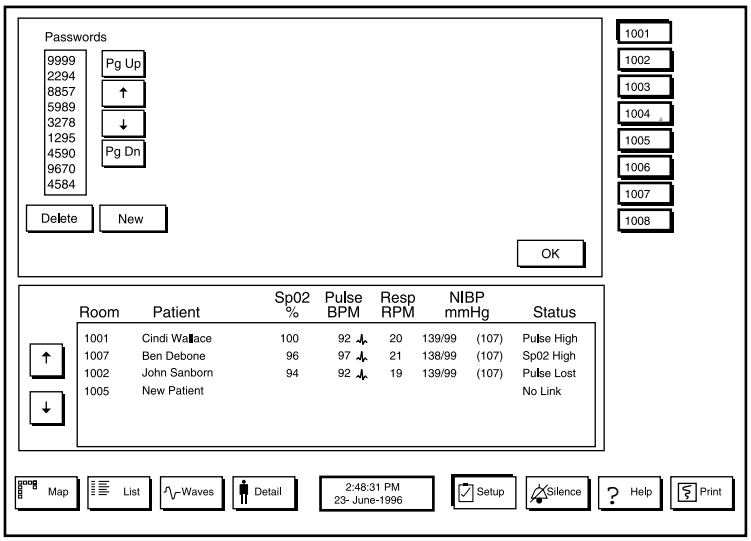

Figure 5-6: System Passwords Maintenance Screen

To enter a new password, click the New button. An on-screen keypad appears. Enter a four-digit password and click the Enter button when finished.

Note: If password "9999" is not deleted, you will still be able to use both password "9999" and the new password. If you wish to use only the new password, then you must delete password "9999".

To delete a password, click the Up Arrow, Down Arrow, Pg Up, and Pg Dn buttons as needed to highlight the password to be deleted. Click the Delete button.

When finished setting system passwords, click the OK button.

5.2.5 Setting System Date and Time

To set or change the system display format, date, or time, access the System Setup screens, enter the password, and click the Date/Time button on the System Setup selection screen. The System Date/Time Setup screen is displayed as shown in Figure 5-7. As you change settings, the date and time display also changes.

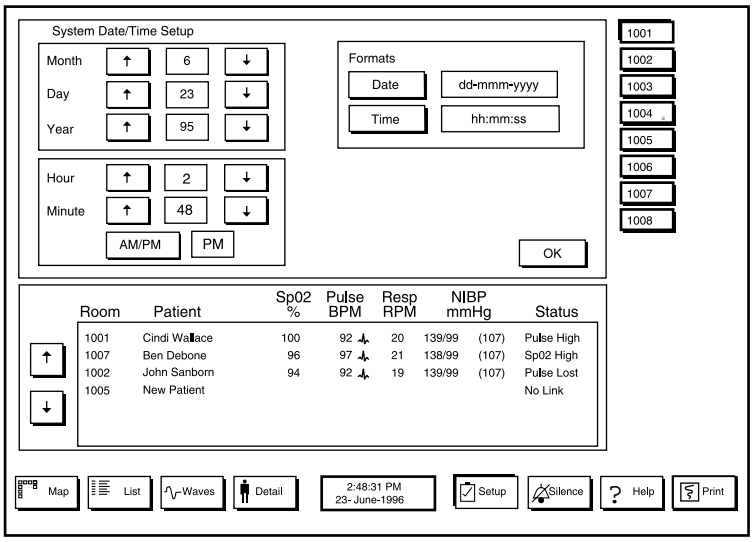

Figure 5-7: System Date/Time Setup Screen

To set or change the system date, click the Up Arrow or Down Arrow buttons adjacent to Month, Day, or Year.

Note: The last two digits of the year can be displayed for the years 1980 through 2079.

To set or change the system time, click the Up Arrow or Down Arrow buttons adjacent to Hour or Minute. Click the AM/PM button to toggle the display between AM and PM.

Note: The AM/PM button is displayed only when a 12-hour clock format is selected.

To set or change the date display format, click the Date button to cycle through the display formats.

To set or change the time display format, click the Time button to cycle through the display formats.

After you have set or changed the system display format, date, or time, click the OK button.

5.2.6 Setting Up System Configuration

To set or change the system configuration, access the System Setup screens, enter the password, and click the Configure button on the System Setup selection screen. The System Configuration screen will be displayed as shown in Figure 5-8. After you have set or changed system configurations, click the OK button.

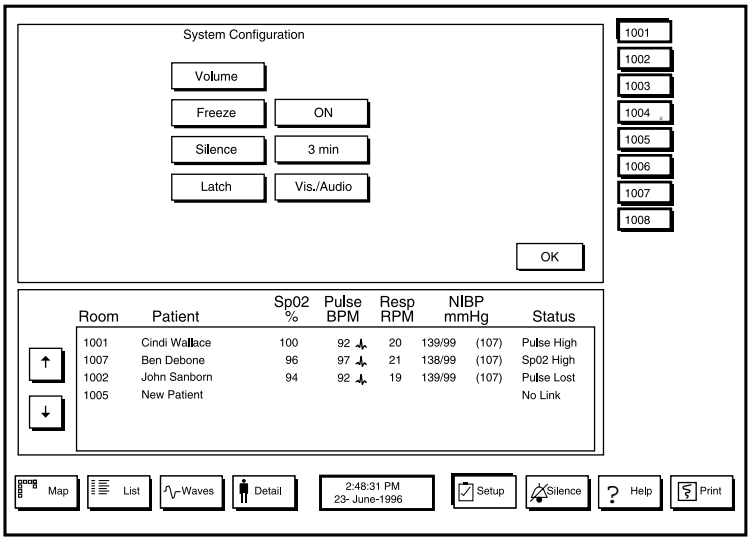

Figure 5-8: System Configuration Setup Screen

5.2.6.1 Setting Waveform Freeze

When a waveform is being displayed, it can be frozen by clicking on the Freeze button until ON is displayed to the right of the button. If waveform freeze is not desired, click the Freeze button as needed until OFF is displayed to the right of the button.

5.2.6.2 Setting System Alarm Silence Period

To set or change the alarm silence period for the central station for monitored bedside station alarms, click the Silence button on the System Configuration screen as needed until the desired alarm silence period is displayed to the right of the button. The alarm silence period can be set for a duration between 30 seconds and 4 minutes at 30-second intervals.

Note: The setting of the alarm silence period at the central station has no effect on the alarm silence period at any bedside station.

5.2.6.3 Setting System Alarm Latching

To set the system alarm latching configuration for the central station, click the Latch button. To set the central station for no alarm latching, click the Latch button as

needed to display OFF in the window to the right of the Latch button. To latch only visual alarms, click the Latch button as needed to display Visual. To latch both visual and audible alarms, click the Latch button as needed to display Vis./Audio.

Note: The setting of alarm latching at the central station has no effect on alarm latching at any bedside station.

5.2.6.4 Setting System Volume Levels

To set the central station alarm and touch click volume levels, click the Volume button. The System Volume Setup screen is displayed as shown in Figure 5-9.

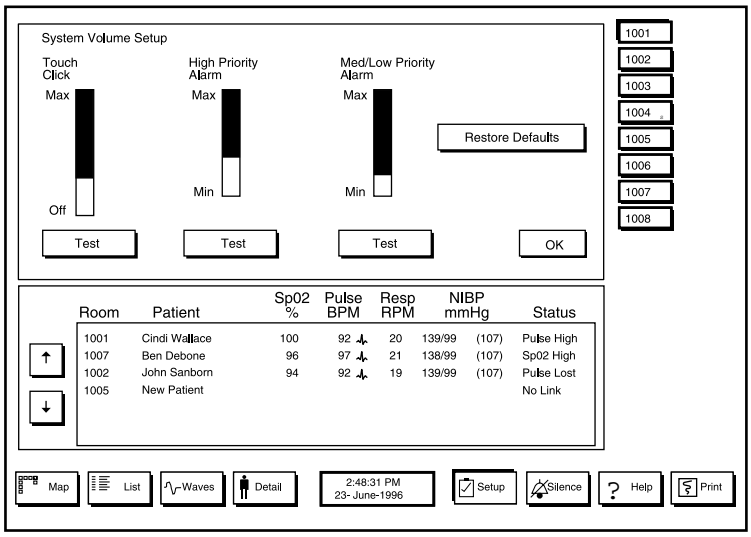

Figure 5-9: System Volume Setup Screen

Click inside the volume setting slider and drag the level indicator to obtain the desired volume level. When the mouse button is released or when you lift your finger from the touchscreen monitor, an example of the click or alarm is heard at the set volume level.

Note: If you adjust a slider bar level and move the pointer outside of the slider bar before the mouse button is released or, with a touchscreen monitor, you move your finger outside of the slider bar before you lift your finger, the slider bar will indicate a new adjusted level. However, the example of the click or alarm is not heard and the actual volume level is not adjusted.

To restore factory default volume levels, click the Restore Defaults button.

Click the Test button under a volume setting slider bar to hear an example of the click or alarm at the actual set volume level. Click the OK button after you have set system volume levels.

5.2.7 Setting System Defaults

To set or change system default settings, access the System Setup screens, enter the password, and click the Defaults button. The System Default Setting screen will be displayed as shown in Figure 5-10.

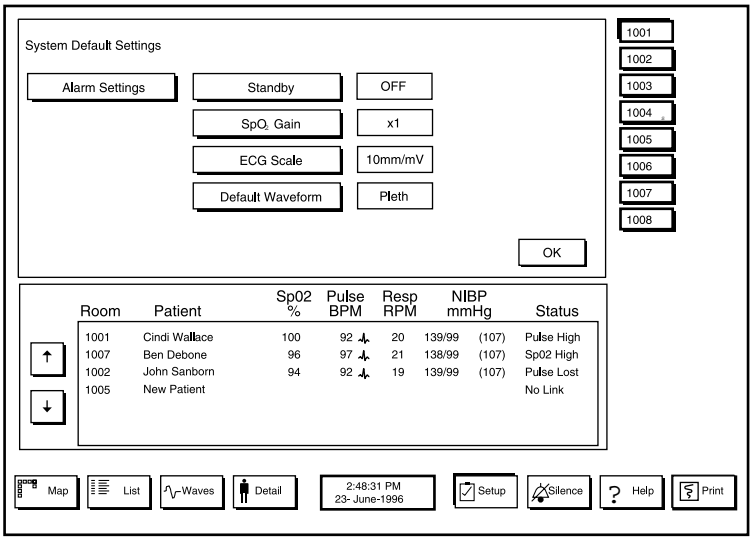

Figure 5-10: System Defaults Setup Screen

After you have made the system default settings, click the OK button on the System Default Setting screen.

5.2.7.1 Setting System Default Channel Standby Setting

To set the system default of the Standby setting, click the Standby button as needed to display ON or OFF. Whenever the new patient function is performed or a new bed box is added to the Map Design screen, the bed will be set to standby setting (ON or OFF) which was selected. By selecting ON, alarms can be avoided until the system is ready to begin monitoring.

5.2.7.2 Setting System Default Channel SpO_2 Gain

To set the default SpO_2 gain, click the SpO_2 Gain button as needed to cycle through gain settings of x0.5, x1, x2, x3, and x4. The value set will be used whenever the new patient function is performed or a new bed box is added to the Map Design screen.

5.2.7.3 Setting System Default ECG Scale

To select the ECG scale, click on the ECG Scale button. Continue clicking the ECG Scale button until the desired scale is displayed in the window to the right of the button. Scales that can be selected are 2.5 mm/mV, 5 mm/mV, 10 mm/mV, 20 mm/mV and 40 mm/mV.

5.2.7.4 Setting System Default Waveform

Either an ECG or a plethysmographic waveform can be displayed. By clicking on the Default Waveform button, the operator can toggle between the two waveforms. The waveform displayed in the window to the right of the Default Waveform button will be the default waveform.

5.2.7.5 Setting System Default Channel Alarms Setting

To set system default alarm settings, click the Alarm Settings button. The System Default Alarm Settings screen will be displayed as shown in Figure 5-11.

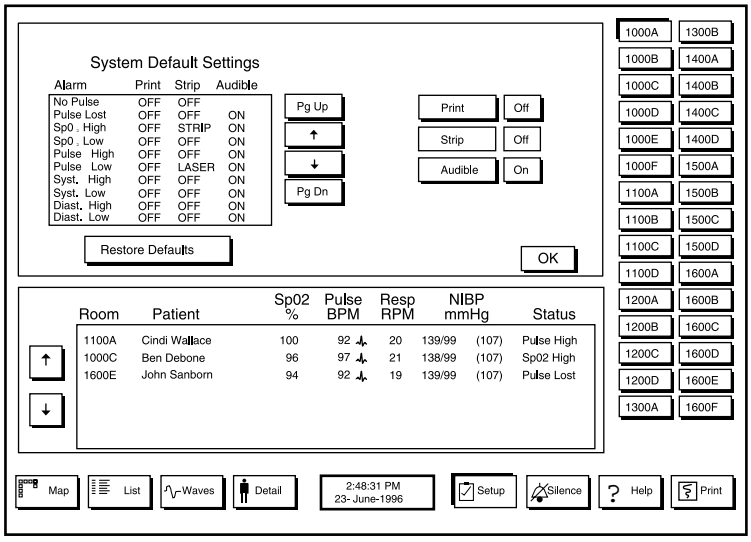

Figure 5-11: System Default Channel Alarm Settings Screen

Click the Up Arrow, Down Arrow, Pg Up, or Pg Dn buttons to scroll the list of alarms and highlight the alarm for which defaults are to be set or changed. Alarm defaults are the settings that are in effect when a new patient is admitted or a new bed box is added to the Map Design screen. Click the Print, Strip, or Audible button as needed to set the alarm defaults for the highlighted alarm.

When Print is set to ON the central station automatically prints a patient data report whenever the selected alarm is received. With Print set to OFF, a patient data report is not printed.

The Strip button can be set to Off, Strip, or Laser. If Strip or Laser is selected, a patient data report will print out if there is a patient alarm. This print out includes the most recent digital data for the patient and an interval waveform which represents data collected from the 10 seconds before and after the alarm condition occurred. Selecting Strip enables a thermal printer in the central station and selecting Laser enables an optional laser printer. There is no printout if Off is selected.

When Audible set to ON the central station generates an audible alarm sound when the selected alarm is received. When Audible is set to OFF, no alarm sounds at the central station when the selected alarm is received. To restore the system default alarm setting to the factory default settings, click the Restore Defaults button. After you have set the system default alarm settings, click the OK button.

5.2.8 Displaying Radio-Link System Channel Setups

To display radio-link channel settings in radio-link systems only, access the System Setup screens, enter the password, and click the Link Info button. The Link Information screen is displayed as shown in Figure 5-12.

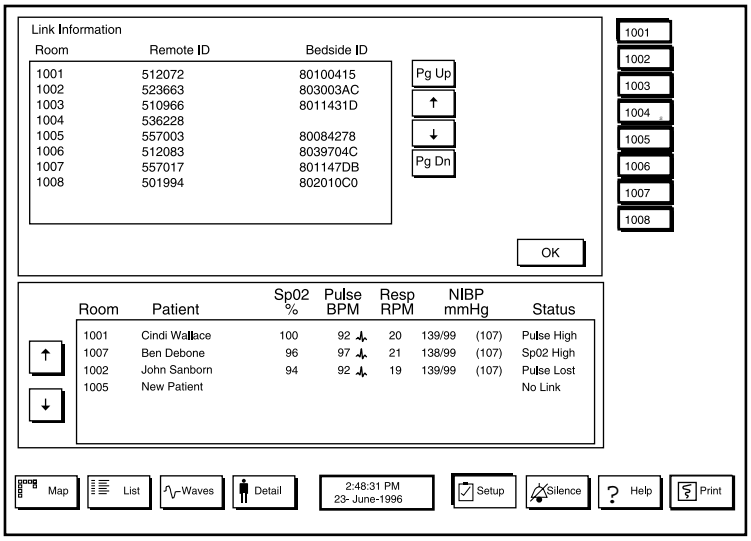

Figure 5-12: Radio-Link System Link Information Screen

Click the Up Arrow, Down Arrow, Pg Up, or Pg Dn buttons to view a list of the room (bed) numbers, Remote IDs, and bedside IDs active in your system. Click the OK button after you have viewed the system channel setups.

5.2.9 Radio-Link Transceiver Maintenance Setup

Transceiver maintenance must be performed when no patients are being monitored. To set up and maintain the system transceiver, access the System Setup screens, enter the password, and click the Transceiver button. The Transceiver Maintenance screen is displayed as shown in Figure 5-13. Click the OK button after you have set up the transceiver.

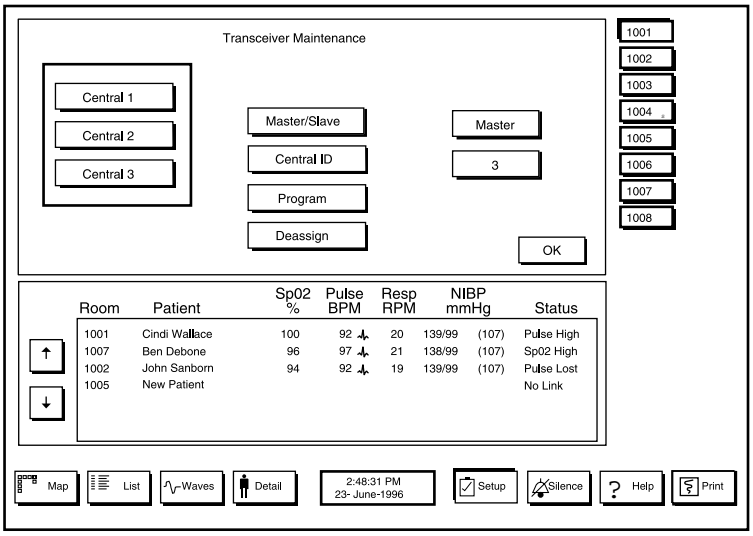

Figure 5-13: System Transceiver Maintenance Screen

Click the Master/Slave button to change the display to the right of the button and designate the central transceiver as a master or slave transceiver. Exactly one central transceiver must be set to master. A spread spectrum central transceiver is always a master. A *slave* central transceiver is synchronized to a *master* central transceiver.

Note: Plug the end of the synchronization cable labeled “master” into the central transceiver that has been designated as master.

Click the Central ID button to select a number from 1 to 53 for the transceiver Central ID. A spread spectrum system should always have an ID of 1. If more than one Central transceiver is being used on a fixed frequency system, select ID numbers that are separated by at least four digits. After changing a radio system Central ID, the Central Station must be turned off for 2 minutes prior to resuming normal monitoring. Once communication is established between a remote bedside transceiver and the central station, the remote transceiver looks for the central station transceiver monitor IDs entered on this screen.

Note: To avoid radio interference when choosing Central ID's, consider other radio systems in or near the facility, operating in the 902 to 928 MHz range.

The Central ID on this page must be changed when patients are not being monitored. The remote transceivers will identify this change and reestablish the communication link with the central station and ignore another central station with a different Central ID that was programmed with other remote transceiver IDs. The Central ID differs from the remote transceiver ID in that each remote transceiver has a fixed and unique ID number that is used in the communication protocol. Each remote transceiver ID has to be programmed into the central station. See paragraph 5.2.9.1, *Programming a Transceiver ID*.

5.2.9.1 Programming a Transceiver ID

Click the Program button to set the Remote ID for any one or all remote transceivers in the system. The programming screen is displayed as shown in Figure 5-14.

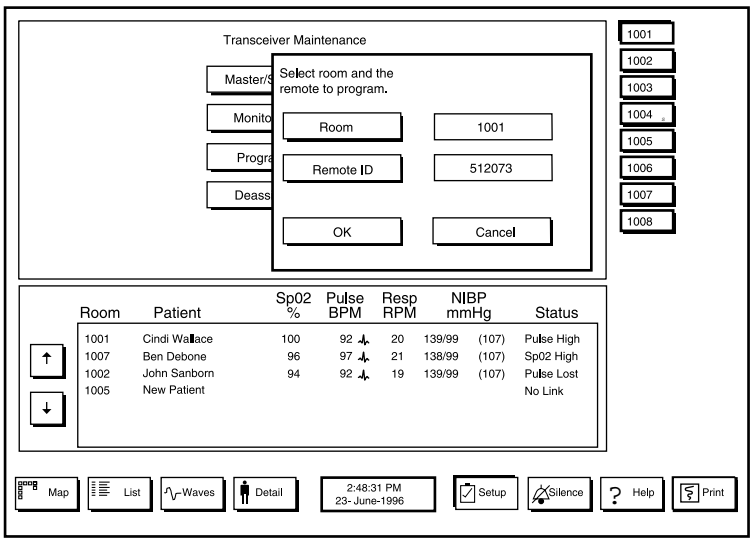

Figure 5-14: Transceiver Programming Screen

Click the Room button as needed to cycle through all available bed numbers and select the bed for which you wish to change or set the remote ID. Click the Remote ID button and a keypad is displayed. Click the numbers to enter the remote ID. Click the OK button in the pop-up window when finished.

Note: If an ID number is entered that has already been selected, the cursor moves to the left of the entry line, giving no way to delete the bad entry. If this happens, enter a valid transceiver number that is not in use, or select any function key at the bottom of the screen except setup, enter the function, exit and then re-enter the setup screen. Another method would be to enter any six-digit number and use the backspace key to delete the number.

5.2.9.2 Deassigning a Transceiver ID

To deassign a remote ID from a bed, click the Deassign button on the System Transceiver Maintenance screen. The Deassign screen is displayed as shown in Figure 5-15.

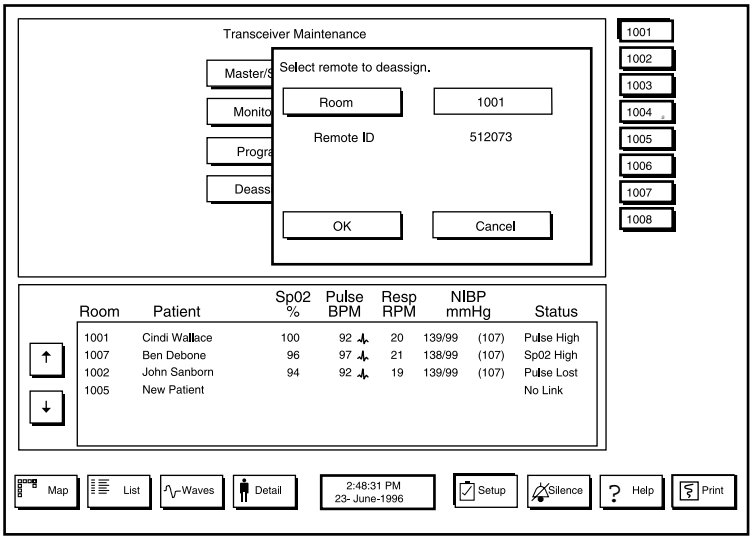

Figure 5-15: Transceiver Deassign Screen

Click the Room button as needed to cycle through all available bed numbers and select the bed for which you wish to deassign the remote ID. Click the OK button in the pop-up window to complete the deassignment. Click the Cancel button to quit the deassignment and make no changes.

5.2.10 Selecting Channel Number

To assign a channel number on hard-wired systems, click on the Setup button and select System. Enter the password and select Map Design, then select the room to have the channel assigned. Enter the room number and select a channel number for that room as shown in Figure 5-16. There can be up to 16 channel numbers and each channel number can be used only one time.

Note: Hard-wired systems can monitor a maximum of 16 beds. A 17th position is provided to allow the user to transfer patients.

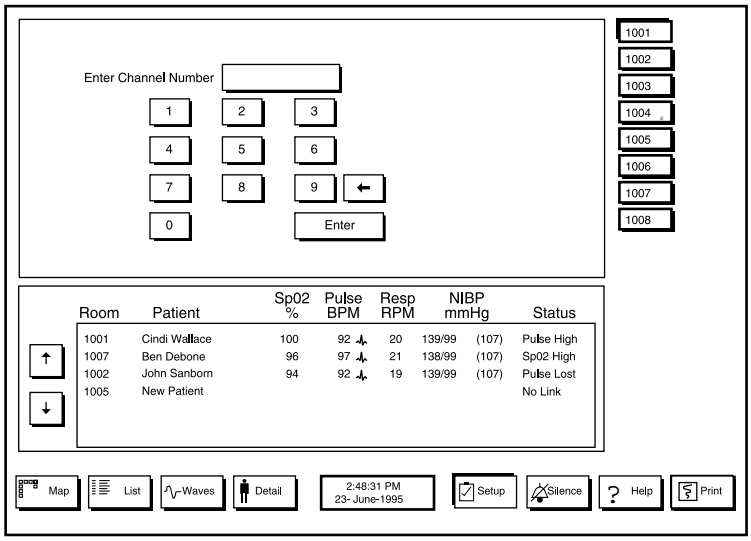

Figure 5-16: Enter Channel Number Screen

5.2.11 Setting System Trends

To set or change system trend time intervals that are used in patient data printouts, access the System Setup screens, enter the password, and click the Trends button on the System Setup Selection screen. The System Trends screen is displayed as shown in Figure 5-17.

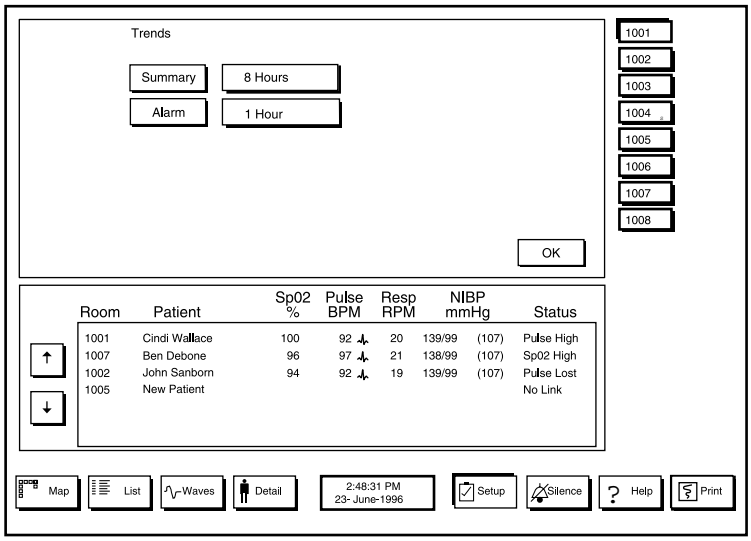

Figure 5-17: System Trends Setup Screen

To set the time interval to be used for a summary patient data printout, click the Summary button to cycle through the values and select the desired time interval. Available selections are 15 or 30 minutes, 1, 2, 4, 8, 12, or 24 hours.

To set the time interval to be used for a patient alarm data printout, click the Alarm button to cycle through the values and select the desired time interval. Available selections are 15 or 30 minutes, 1, 2, 4, 8, 12, or 24 hours.

After you have set system printout time intervals, click the OK button. The displayed values are set as the system trend values.

5.2.12 Displaying a List of System Events

The central station computer maintains a log of system events such as when the computer is turned on or when System Setup has been accessed. To display a list of up to 99 system events, access the System Setup screens, enter the password, and click the Events button on the System Setup selection screen. The System Events screen is displayed as shown in Figure 5-18.

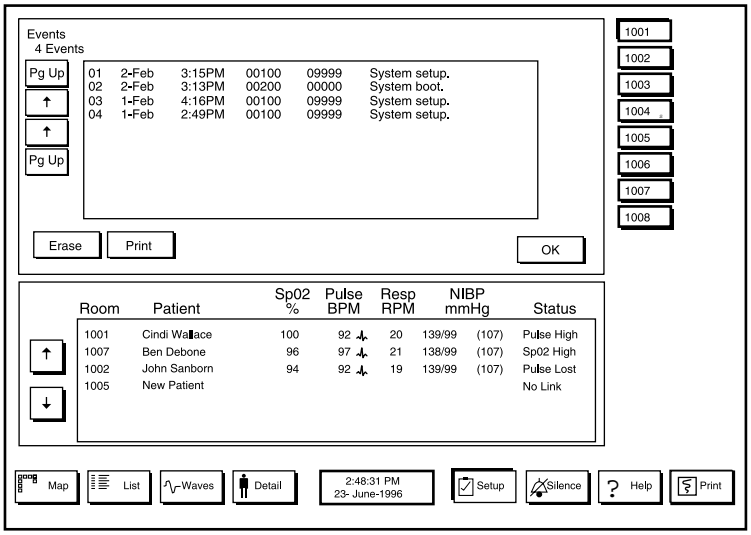

Figure 5-18: System Events Screen

Click the Up Arrow, Down Arrow, Pg Up, or Pg Dn buttons to scroll through a list of the most recent system events (up to 99 entries).

To erase the list of system events from the computer memory, click the Erase button. You are prompted to confirm that you do want to erase the entire list of system events. Click the Yes button to erase the list. Click the No button if you do not want to erase the list.

To print the current list of system events on the facility-provided laser printer connected to the central station computer, click the Print button.

After you have displayed the list of system events, click the OK button.

5.2.13 Touchscreen Calibration

To calibrate a touchscreen monitor, access the System Setup screens, enter the password, and click the Touch Cal button. Observe the screen and touch the screen where indicated to calibrate the touchscreen monitor. A touchscreen should be calibrated every time the computer or touchscreen monitor has been turned off and back on again, or when necessary.

Note: The Touch Cal button will not show on the screen until the touchscreen has been touched. Before attempting to calibrate the touchscreen use the touchscreen function.

5.2.14 Exiting to DOS

WARNING: Patient safety could be compromised if the DOS function is used while patients are being monitored. The DOS function stops all monitoring functions of the *Oxinet II* monitoring system. Only the system administrator or other qualified personnel should use the DOS function.

To exit to DOS from the *Oxinet II* system software, access the System Setup screens, enter the password, and click the DOS button on the System Setup Selection screen. You are prompted to confirm that you want to exit to DOS. Click the Yes button to exit to DOS. Click the No button to return to the System Setup Selection screen.

5.2.15 Entering the *Oxinet II* System from DOS

There are two methods to enter the *Oxinet II* system from DOS.

At the DOS prompt type in START and press enter. The second option is to turn the central station off, then turn it back on again.

SECTION 6: TROUBLESHOOTING

6.1 Introduction
6.2 How to Use This Section
6.3 Who Should Perform Repairs
6.4 Replacement Level Supported
6.5 Obtaining Replacement Parts
6.6 Troubleshooting Guide

6.1 INTRODUCTION

This section explains how to troubleshoot the *Oxinet II* monitoring system if problems arise. Tables are supplied that list possible difficulties, along with probable causes, and recommended actions to correct each difficulty. Also refer to the manuals shipped with your system for the computer, the monitor, the uninterruptible power supply, the video board, and the touchscreen controller board.

6.2 HOW TO USE THIS SECTION

Use this section in conjunction with Section 3, *Performance Verification*, and Section 7, *Spare Parts*. The *System Level Block Diagram Analysis*, in section 10, offers information on how the components of the *Oxinet II* system function.

6.3 WHO SHOULD PERFORM REPAIRS

Only qualified service personnel should remove and replace components of the *Oxinet II* monitoring system. If your medical facility does not have qualified service personnel, contact Nellcor's Technical Services Department or your local Nellcor representative.

6.4 REPLACEMENT LEVEL SUPPORTED

Any difficulties isolated to the central station computer, the touchscreen monitor, the uninterruptible power supply (UPS), or a remote radio transceiver will result in replacement of the component in its entirety.

6.5 OBTAINING REPLACEMENT PARTS

Nellcor's Technical Services Department provides technical assistance information and replacement parts. To obtain replacement parts, contact Nellcor. Refer to parts by the part names and part numbers listed in Section 7, *Spare Parts*.

6.6 TROUBLESHOOTING GUIDE

If you encounter a difficulty, refer to Table 6-1 that provides a list of symptoms, the probable cause, and a recommended course of action to correct the difficulty. For a symptom that is not listed in Table 6-1, contact Nellcor's Technical Services Department or your local Nellcor representative. Once you have performed the recommended action, refer to Section 3, *Performance Verification*, and conduct a performance verification before returning the *Oxinet II* monitoring system to service. If the symptom persists, continue troubleshooting.

Table 6-1: Troubleshooting		
Symptom	**Possible Causes**	**Corrective Action**
The central station does not turn on or has shut off unexpectedly.	The AC power cord is unplugged or disconnected from the uninterruptible power supply (UPS), the computer, or the touchscreen monitor.	Check that all power cords are plugged into the UPS, the wall receptacle, the computer, and the touchscreen monitor. Plug in power cords as needed.
	AC power is off at the wall receptacle.	Call your facility clinical engineer to check that power is available at the wall receptacle and that circuit breakers for the AC power circuit are on.
	The UPS is not operating correctly.	Remove and replace the UPS.
	The computer internal hard drive is not operating correctly.	Disconnect and replace the computer. Contact Nellcor's Technical Services Department for return procedures.
	The computer internal mother PCB is not operating correctly.	Disconnect and replace the computer. Contact Nellcor's Technical Services Department for return procedures.
No link can be established between a bedside monitor and the central station (Hard-wired Systems).	The bedside station is running on internal batteries.	Verify that the bedside station is plugged into a properly functioning AC power source and that the power switch is turned on.
	The cable from the bedside monitor is not connected to the proper channel on the central station.	Verify the bedside station is connected to the same channel the central station is accessing.
	The output baud rate of the bedside station is not 9600.	Consult the NPB-290, NPB-295, N-395, N-595, or N-3000 operator's manual for instructions on how to change the baud rate.
	The output of the bedside station does not match the input of the central station.	Verify that both the bedside station and central station are set up for either RS-232 or RS-422. Consult the NPB-290, NPB-295, N-395, N-595, or N-3000 operator's manual for instructions on how to change the output configuration. See paragraph 1.4.4, *Data Communication Configuration*, for instructions on how to change the input of the I/O PCB and the expansion card.

Table 6-1: Troubleshooting

Symptom	Possible Causes	Corrective Action
The communication link is lost or intermittent between a single bedside station and the central station.	Power to the bedside station is lost or intermittent.	At the bedside station, check that the power supply AC power cord is securely plugged into the power supply and into the wall receptacle and that power is available at the receptacle. Plug the power cord in as needed. Check that the power supply is securely connected to the bedside station. Reconnect the power supply as needed. Refer to Table 6-2 and observe the status of the LED on the top of the remote radio transceiver.
	The communication cable between NPB-290, NPB-295, N-395, N-595, N-3000 and remote radio transceiver is disconnected or loose at the bedside station.	Refer to Table 6-2 and observe the status of the LED on the top of the remote radio transceiver. Check the communication cable connections at the bedside station between the NPB-290, NPB-295, N-395, N-595, N-3000 and the remote radio transceiver. Reconnect the cable as needed.
	There is radio frequency interference with the radio signal between the central station and the bedside station.	Refer to Table 6-2 and observe the status of the LED on the top of the remote radio transceiver. Move the bedside station; if that does not correct the problem, contact Nellcor's Technical Services Department.
	The remote radio transceiver at the bedside station is not operating correctly.	Refer to Table 6-2 and observe the status of the LED on the top of the remote radio transceiver. Remove and replace the remote radio transceiver at the bedside station if needed.
	Fixed frequency systems can experience interference when multiple transceivers are in use.	Verify that a synchronization cable is installed between the I/O PCBs.
	Multiple *Oxinet II* systems operating close to each other can experience interference.	Verify that a synchronization cable is installed between the central stations.
The communication link is lost or intermittent among all bedside stations and the central station.	One or more central station antenna connection is disconnected or loose.	Check central station antenna connections. Reconnect as needed.

Table 6-1: Troubleshooting

Symptom	Possible Causes	Corrective Action
	There is radio frequency interference in the immediate vicinity of the central station antennas.	Check the area in the immediate vicinity of the central station antennas for a source of radio frequency interference and remove any sources of interference. If that does not correct the problem, contact Nellcor's Technical Services Department.
Audible alarms cannot be heard at the central station.	The computer internal speaker is loose or disconnected from the sound PCB in the computer.	Disconnect and replace the computer. Contact Nellcor's Technical Services Department for return procedures.
	The sound PCB is not operating correctly.	Disconnect and replace the computer. Contact Nellcor's Technical Services Department for return procedures.
There are excessive patient false alarms.	Alarm limits are not set properly at the bedside station.	Refer to the appropriate operator's manual for the monitor causing the false alarms to set new alarm limits.
	There is an intermittent communication link.	See Corrective Action for *The communication link is lost or intermittent between a single bedside station and the central station* above.
The *Oxinet II* computer resets and restarts unexpectedly.	AC power cord connections are loose at the central station.	Check that power cords are securely plugged into the back of the central station computer, the UPS, and the wall receptacle. Plug in power cords as needed.
	The UPS is not operating correctly.	Disconnect and replace the UPS. Contact Nellcor's Technical Services Department for return procedures.
	There is a problem with the central station computer.	Disconnect and replace the computer. Contact Nellcor's Technical Services Department for return procedures.
	The internal computer power supply is not operating correctly.	Disconnect and replace the computer. Contact Nellcor's Technical Services Department for return procedures.
	The internal computer mother PCB is not operating correctly.	Disconnect and replace the computer. Contact Nellcor's Technical Services Department for return procedures.
Video is not displayed on the touchscreen monitor or is intermittent; all other functions are operating correctly.	The cable between the touchscreen monitor and the computer video board is loose or disconnected.	Reconnect the cable between the touchscreen monitor and the computer video board.

Table 6-1: Troubleshooting		
Symptom	**Possible Causes**	**Corrective Action**
	The touchscreen monitor is not operating correctly.	Disconnect and replace the touchscreen monitor. Contact Nellcor's Technical Services Department for return procedures.
	The video PCB is not operating correctly.	Disconnect and replace the computer. Contact Nellcor's Technical Services Department for return procedures.
Items cannot be selected on the touchscreen monitor by touching the screen.	The cable between the touchscreen monitor and the computer touchscreen controller PCB is loose or disconnected.	Reconnect the cable between the touchscreen monitor and the computer touchscreen controller PCB.
	The touchscreen monitor is out of calibration.	Calibrate the touchscreen monitor. Refer to *Performing Touchscreen Calibration* in Section 5.
	The touchscreen controller PCB is not operating correctly.	Disconnect and replace the computer. Contact Nellcor's Technical Services Department for return procedures.
The thermal printer does not print.	The thermal printer is out of paper.	Install paper in the thermal printer per instructions in paragraph 4.3.
	The front door of the printer is not properly closed.	Verify that the front door of the printer is latched closed.
The paper moves but there is no printout.	The printer paper is in backwards.	Check for proper installation of printer paper per instructions in paragraph 4.3
There are blank areas in the printout.	The print head is dirty.	Carefully clean the print head using cotton and alcohol. Refer to the thermal printer manual.

Table 6-2: Remote Radio Transceiver LED Indications

LED Indication	Definition
Solid Green	Ongoing communication is established with the central station.
Flashing Green	Communication is established with the central station but is intermittent.
Flashing Red	The central station has been detected and the remote radio transceiver has received a message with its transceiver ID, but is currently not receiving any messages with its transceiver ID.
Solid Red	The central station has been detected, but the remote radio transceiver has not received a message with its transceiver ID.
Off (NPB-290, NPB-295, N-395, or N-595)	The remote radio transceiver is not receiving power from the radio power supply.
Off (N-3000)	The remote radio transceiver is not receiving power from the N-3000.

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SECTION 7: SPARE PARTS

7.1 Introduction
7.2 Replacement Parts

7.1 INTRODUCTION

Caution: To avoid corrupting patient data, exit to DOS before turning off the computer.

Components of the *Oxinet II* system, as shown in Figure 7-1, are replaced in their entirety. Refer to Section 2, *Equipment Installation and Hookup,* to install the replacement component.

Note: Some replacement parts you receive will have a business reply card attached. When you receive these replacement parts, please fill out and return the business reply card.

Before removing and replacing a component of the *Oxinet II* monitoring system, disconnect all cables. Refer to Section 2, *Equipment Installation and Hookup,* to install the replacement component.

Replacement parts, along with the corresponding Nellcor part numbers, are shown in Table 7-1. Figure 7-1 shows the replaceable *Oxinet II* system components with numbered callouts in parentheses corresponding to items in Table 7-1

Table 7-2 identifies the radio kit and Table 7-3 identifies the hard-wire cable kit.

7.2 *OXINET II* REPLACEMENT PARTS

Table 7-1: Replacement Parts

Item		Part Number
(1)	Uninterruptible Power Supply	902089
(2)	Mouse	902038
(3)	Keyboard	902040
(4)	15-inch Flat Touchscreen Monitor	NCMM-15LCDT
(4)	19-inch Touchscreen Monitor	NCMM-19
(5)	Touchscreen Control Cable	730001
(6)	Remote Radio Transceiver (Spread spectrum)	NSMR-900
(6)	Remote Radio Transceiver (Fixed frequency)	NSMR-900F
	Cable, central station to wall, 10-ft	035427
	Cable, monitor to wall, 12-ft (N-3000 Only)	035425

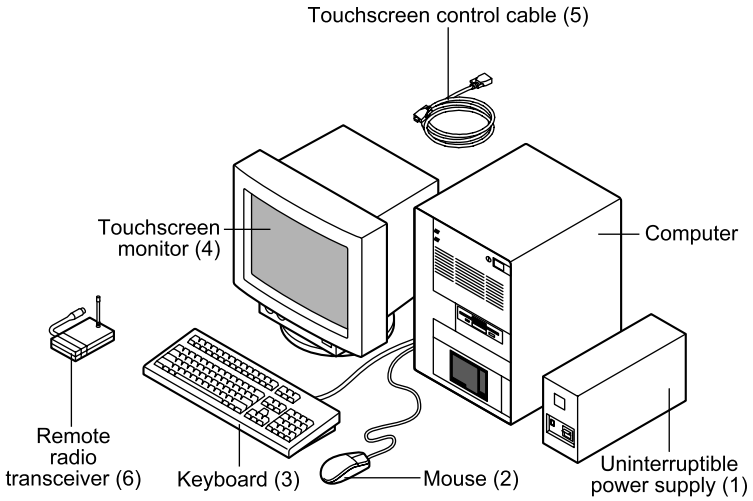

Figure 7-1: *Oxinet II* System Replacement Parts

7.3 NPB-290, NPB-295, N-395, AND N-595 RADIO KIT REPLACEMENT

Order a complete radio kit if a component needs replacing. Table 7-2 defines the components of the radio kit.

Table 7-2: Radio Kit, Part Number 036342

Kit Contains
Oxinet II Radio Cable
Directions for Use
Radio Power Supply (wall mount)
Hex Standoffs

7.4 NPB-290, NPB-295, N-395, AND N-595 *OXINET II* HARD-WIRE CABLE KIT REPLACEMENT

Order a complete *Oxinet* hard-wire cable kit if a component needs replacing. Table 7-3 defines the components of the hard-wire kit.

Table 7-3: Cable Kit, Part Number 036344

Kit Contains
Oxinet II Hard-wire Cable
Directions for Use
Hex Standoffs

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SECTION 8: PACKING FOR SHIPMENT

8.1 General Instructions
8.2 Repacking in Original Carton
8.3 Repacking in a Different Carton

To ship an *Oxinet II* system component for any reason, follow the instructions in this section.

8.1 GENERAL INSTRUCTIONS

Pack the component carefully. Failure to follow the instructions in this section may result in loss or damage not covered by the Nellcor warranty. If the original shipping carton and material are not available, use other suitable shipping materials and container.

Prior to shipping the component, contact Nellcor's Technical Services Department for a returned goods authorization (RGA) number. Mark the shipping carton and any shipping forms with the RGA number.

Return the product by any method that provides proof of delivery.

8.2 REPACKING IN ORIGINAL CARTON

If available, use the original carton and packing materials. Refer to the following paragraphs for packing instructions.

Paragraph	Item to Pack
8.2.1	Computer
8.2.1	15-inch Monitor
8.2.3	19-inch Monitor
8.2.4	Remote Transceiver
8.2.5	Uninterruptible Power Supply

8.2.1 Repacking the Computer

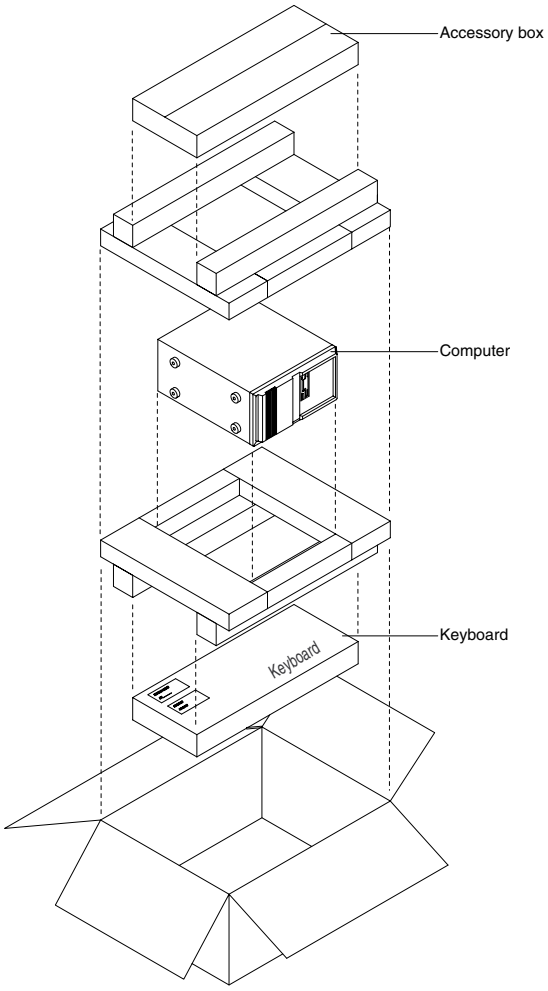

Figure 8-1: Repacking the Computer

Use the following procedure to repack the computer and any accessories.

1. Place the computer and, if necessary, the mouse and keyboard in their original packaging as shown in Figure 8-1.
2. Place in shipping carton and seal carton with packaging tape.
3. Label carton with shipping address, return address, and RGA number, if applicable.

8.2.2 Repacking the 15-Inch Touchscreen Monitor

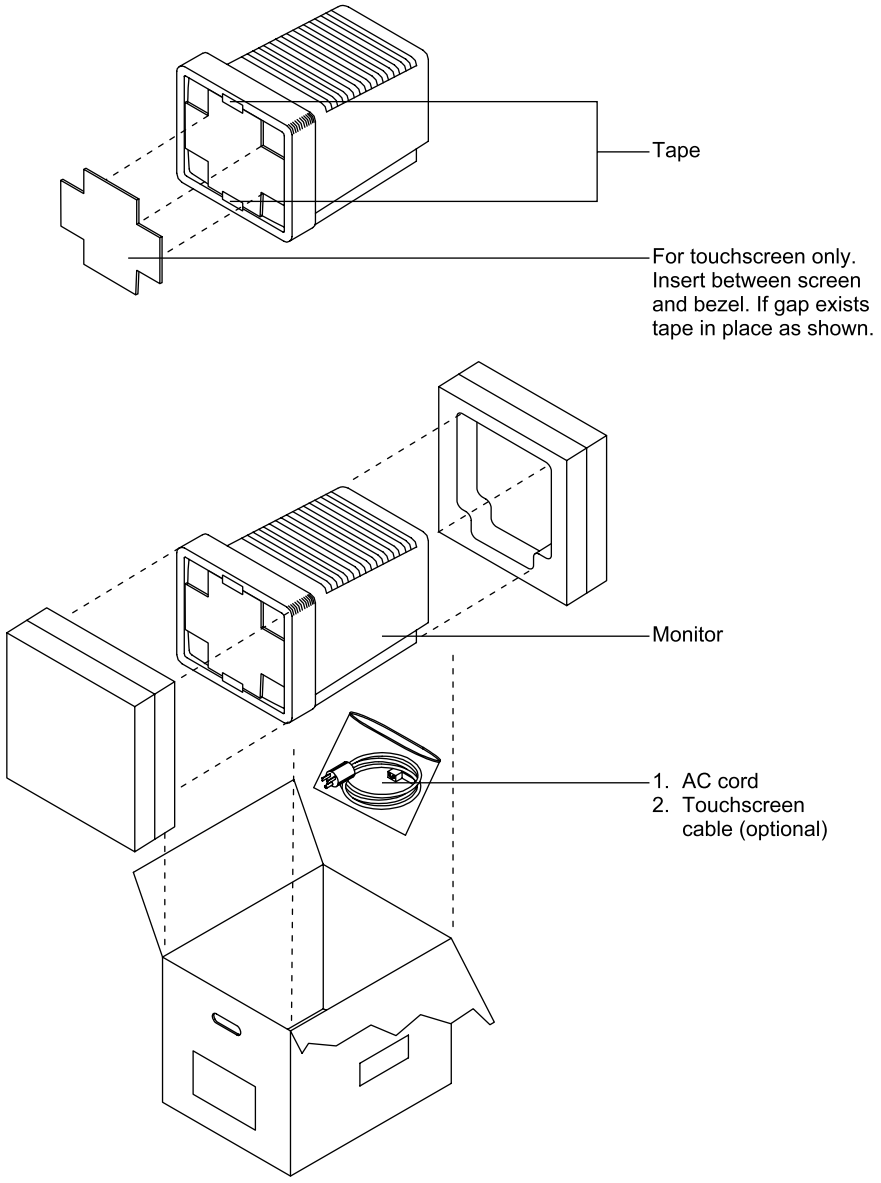

Figure 8-2: Repacking the 15-Inch Touchscreen Monitor

Use the following procedure to repack the 15-inch touchscreen monitor and any accessories.

1. Place the 15-inch touchscreen monitor in its original packaging as shown in Figure 8-2.
2. Place in shipping carton and seal carton with packaging tape.
3. Label carton with shipping address, return address, and RGA number, if applicable.

8.2.3 Repacking the 19-inch Touchscreen Monitor

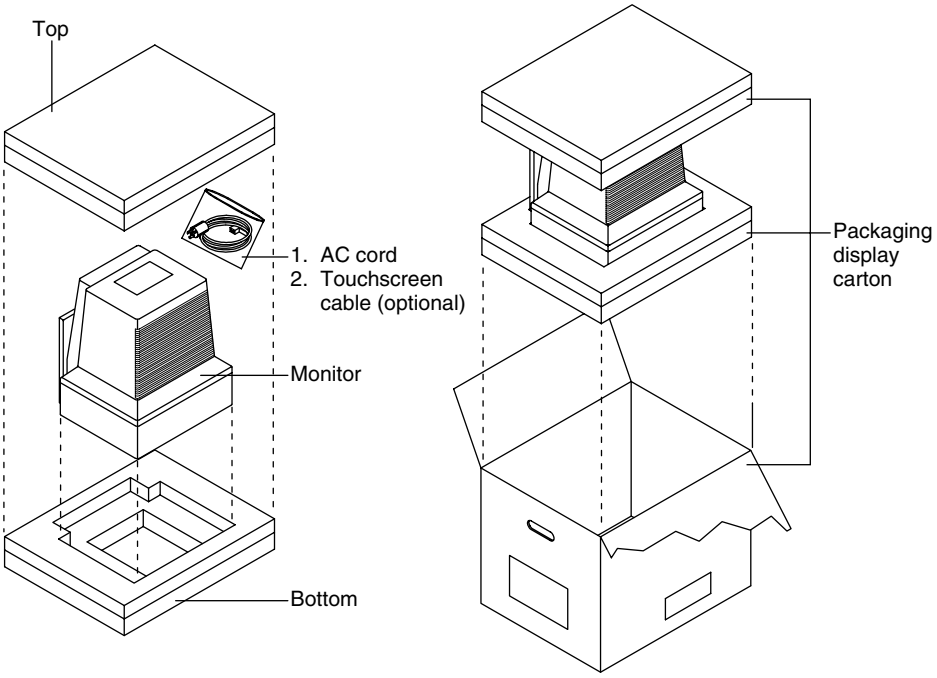

Figure 8-3: Repacking the 19-Inch Touchscreen Monitor

Use the following procedure to repack the 19-inch touchscreen monitor and any accessories.

1. Place the 19-inch touchscreen monitor in its original packaging as shown in Figure 8-3.
2. Place in shipping carton and seal carton with packaging tape.
3. Label carton with shipping address, return address, and RGA number, if applicable.

8.2.4 Repacking the Remote Radio Transceiver

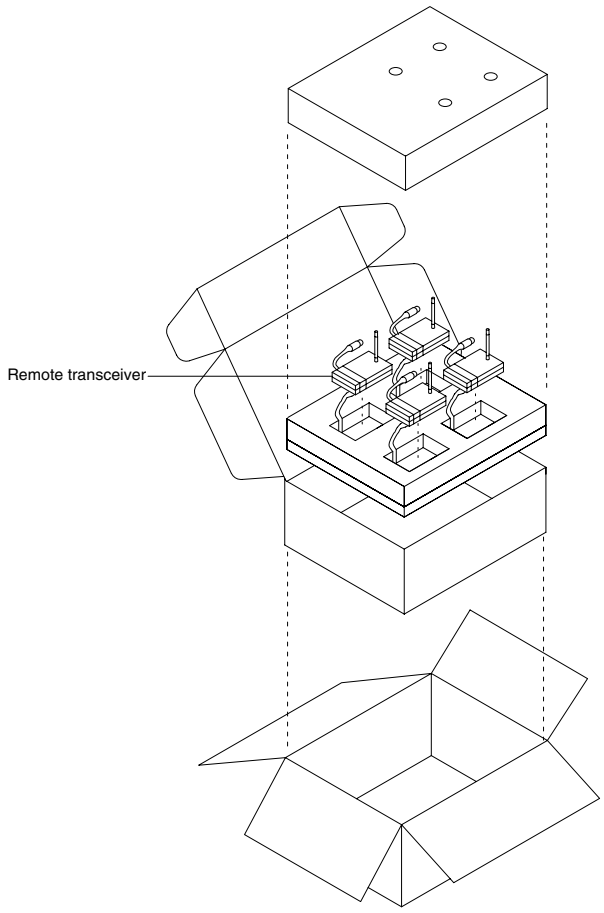

Figure 8-4: Repacking the Remote Transceiver

Use the following procedure to repack the remote radio transceivers.

1. Place one to four remote radio transceivers in the original packaging as shown in Figure 8-4.
2. Place in shipping carton and seal carton with packaging tape.
3. Label carton with shipping address, return address, and RGA number, if applicable.

8.2.5 Repacking the Uninterruptible Power Supply

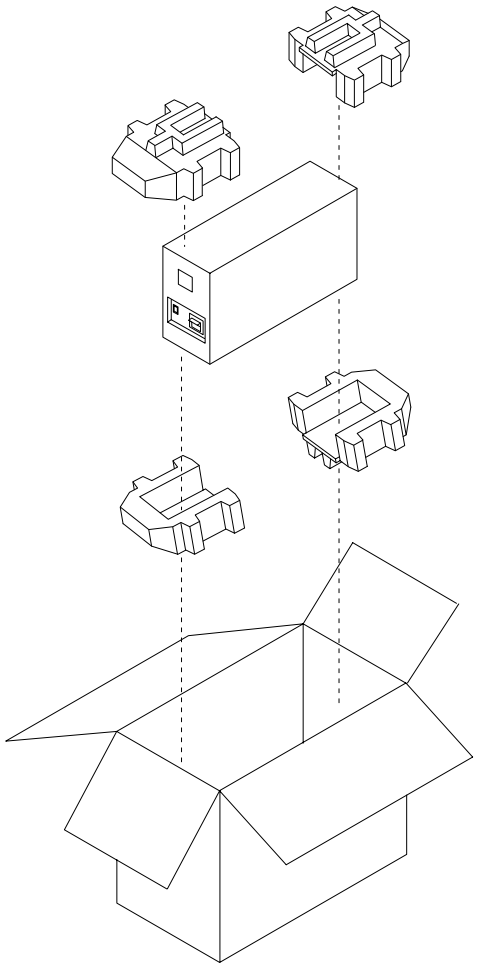

Figure 8-5: Repacking the Uninterruptible Power Supply

Use the following procedure to repack the uninterruptible power supply.

1. Place the uninterruptible power supply in the original packaging as shown in Figure 8-5.
2. Place in shipping carton and seal carton with packaging tape.
3. Label carton with shipping address, return address, and RGA number, if applicable.

8.3 REPACKING IN A DIFFERENT CARTON

If the original carton is not available:

1. Place the component in a plastic bag.
2. Locate a corrugated cardboard shipping carton with at least 200 pounds per square inch (psi) bursting strength.
3. Fill the bottom of the carton with at least 2 inches of packing material.
4. Place the bagged component on the layer of packing material and fill the box completely with packing material such that there is at least 2 inches of packing material around all sides of the component.
5. Seal the carton with packing tape.
6. Label carton with shipping address, return address, and RGA number, if applicable.

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SECTION 9: SPECIFICATIONS

9.1 Agency Regulatory Notices
9.2 Electrical
9.3 Physical Characteristics
9.4 Environmental
9.5 Hard-wired Systems
9.6 Laser Printer Minimum Requirements
9.7 Component and System Labels

9.1 AGENCY REGULATORY NOTICES

The central station complies with the following environmental and performance testing and inspection requirements:

CSA 22.2 no. 125

UL 544

IEC 801.2-5 with FDA allowable exceptions

FCC part 15, Section 247 - Spread Spectrum

FCC part 15, Section 249 - Fixed Frequency

EN 50081-1

EN 55022/CISPR 11 Class A

This device complies with CSA 22.2 No. 950 and IEC 601-1-1.

9.2 ELECTRICAL

9.2.1 External AC Input Voltage/Current

Computer

100-120 Vac, 50/60 Hz, 3.5 A or
200-240 Vac, 50/60 Hz, 2 A

15- and 19-inch Touchscreen Monitor

100-250 Vac, 50/60 Hz 2.2 A (maximum auto-sensing)

Uninterruptible Power Supply

120 Vac, 60 Hz, 5 A (maximum with computer and monitor connected) Maximum Output Load: 250 W

9.3 PHYSICAL CHARACTERISTICS

9.3.1 Dimensions

Computer

22.8 cm (9 in.) x 38.1 cm (15 in.) x 43.2 cm (17 in.)

15-inch Touchscreen Monitor

Depends on the monitor supplied with your system. Monitors are purchased from different manufacturers.

19-inch Touchscreen Monitor

Depends on the monitor supplied with your system. Monitors are purchased from different manufacturers.

Uninterruptible Power Supply

15.0 cm (6.0 in.) x 9.0 cm (3.4 in.) x 33.0 cm (13.1 in.)

Bedside Station Radio Transceiver

12.5 cm (4.92 in.) x 6.7 cm (2.64 in.) x 3.0 cm (1.18 in.)

9.3.2 Weight

Computer

18 kg (40 lbs)

15-inch Touchscreen Monitor

Depends on the monitor supplied with your system. Monitors are purchased from different manufacturers.

19-inch Touchscreen Monitor

Depends on the monitor supplied with your system. Monitors are purchased from different manufacturers.

Uninterruptible Power Supply

5.0 kg (11 lbs)

Bedside Station Radio Transceiver

0.18 kg (6.5 oz)

9.4 ENVIRONMENTAL

9.4.1 Temperature

Operating

+10°C to +35°C (+50°F to +95°F)

Shipping/Storage (In sealed shipping container)

-20°C to +60°C (-4°F to +140°F)

9.4.2 Relative Humidity

Operating

15% RH to 85% RH (non-condensing)

Shipping/Storage

(In sealed shipping container)
95% at 35º C (95º F) maximum, non-condensing

9.5 HARD-WIRED SYSTEMS

Wiring used within the building should be category 5 cable and comply with local building codes. End connectors are female RJ-45.

9.6 LASER PRINTER MINIMUM REQUIREMENTS

The *Oxinet II* monitoring system supports printers that are both HPGL/2 and PCL5 compatible with a minimum of 2 megabytes of printer memory such as the Hewlett-Packard LaserJet models 4, 4SI, 4L, 5, 5SI, and 5L printers.

9.7 COMPONENT AND SYSTEM LABELS

An identification label showing product part number, model, serial number, and hardware level is affixed on the rear panel of the central station computer by the original manufacturer. This label facilitates product traceability through the manufacturer's product records system.

Another label shows CSA/NRTL/C certification that is applicable to the *Oxinet II* monitoring system as a whole. This certification is based on the Canadian Standard for Electromedical Equipment, C22.2, No. 125 and the Underwriters Laboratories Standard for Medical and Dental Equipment, UL544.

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SECTION 10: TECHNICAL SUPPLEMENT

10.1 Introduction
10.2 System-Level Block Diagram Analysis
10.3 Radio-Link Data Communications Overview
10.4 Hard-wired System-Level Block Diagram Analysis

10.1 INTRODUCTION

This *Technical Supplement* provides a system-level block diagram theory of operation and a description of the principles of radio-link data communications or hard-wired systems used with the *Oxinet II* monitoring system.

10.2 RADIO-LINK SYSTEM-LEVEL BLOCK DIAGRAM ANALYSIS

For this description, refer to Figure 10-1 for a system-level block diagram of the *Oxinet II* monitoring system. One of two systems can be used: Spread Spectrum or Fixed Frequency, as discussed in paragraph 10.3 on page 10-3.

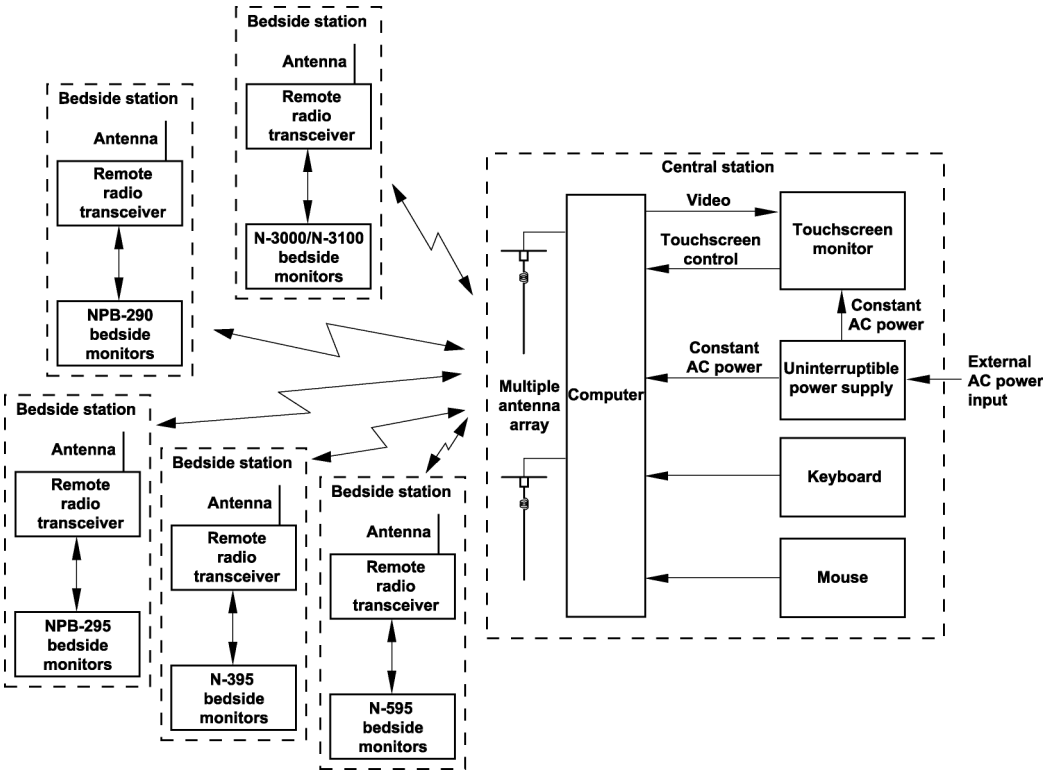

Figure 10-1: *Oxinet II* System-Level Block Diagram

10.2.1 System Overview

The *Oxinet II* monitoring system consists of the central monitoring station (central station) and up to 30 individual bedside stations each consisting of an NPB-290, NPB-295, N-395, N-595, or an N-3000 pulse oximeter, an N-3100 noninvasive

blood pressure monitor (optional), an N-3200 waveform monitor (optional), and a remote radio transceiver.

At each bedside station, patient parameters such as percent of blood oxygen saturation, pulse rate, and blood pressure are measured by the bedside station monitors. This patient parameter data is then transmitted to the central station and displayed, which allows simultaneous monitoring of up to 30 remotely located patients at one convenient central location. When a patient's monitored parameter exceeds a limit preset at the bedside monitor, an alarm is sounded at the bedside station and reported with audible and visual indications at the central station.

Note: A 31st position is added to systems monitoring all 30 bedside stations to ease patient transfers.

10.2.2 Computer

The computer is the primary component of the *Oxinet II* monitoring system. The computer is a standard personal computer and uses a 500 MHz Pentium III-based motherboard, a hard drive, a 3.5-inch floppy drive, a video board, and a power supply. The computer also contains a touchscreen controller board that is the interface between the computer and the touchscreen modification to the monitor. The function of the touchscreen monitor and interface is described in paragraph 10.2.3 *Touchscreen Monitor*. The computer also receives operator input from a standard 101-key keyboard and a mouse.

Unique to the *Oxinet II* system, the computer also contains a multi I/O soundboard and a central radio transceiver board. The function of the central radio transceiver is described in paragraph 10.3 *Radio-Link Data Communications Overview*.

The soundboard contains a processor and controls communications between the *Oxinet II* system and the bedside stations. The soundboard also controls and generates the audio alarms at the central station, provides the interface for the thermal printer, and has a watchdog circuit. A watchdog reset cable connected between the multi I/O PCB and the motherboard resets the processor if there is a system fault. The system will then run a POST (Power On Self Test). If POST is completed successfully, normal monitoring will resume.

Units may be equipped with an optional thermal printer. This printer will be connected to the sound card. The thermal printer will provide digital data and a waveform printout during an alarm condition or at the request of the operator. The waveform will include the 10-second period before and after the print initialization and the most current digital data for the patient.

10.2.3 Touchscreen Monitor

The monitor has been modified to include a touchscreen function. A glass panel with small ultrasonic transducers is installed on the face of the existing monitor screen.

The X-axis and Y-axis of the glass panel each has a transmitting and a receiving transducer and sets of reflecting strips. A drive signal is sent from the touchscreen controller board in the computer to the transmitting transducers in the monitor which, in turn, create an acoustic wave pattern on the face of the glass panel. The receiving transducers receive the acoustic signal and send the received signal back

to the touchscreen controller board. A reference-received pattern for the untouched screen is established.

When an object such as an operator's finger or any other sound-absorbing object touches the glass panel, a portion of the acoustic energy is absorbed. The resulting change in the received pattern is compared to the reference pattern and analyzed. X and Y coordinates of the touch location are calculated. A Z-axis value is also calculated that is determined by measuring how much signal is attenuated at the touch location. The X, Y, and Z coordinates of the touch location are then calculated by the touchscreen controller board and provided to the computer. The computer then uses the touch location data to generate a pointer cursor on the monitor display at the touch location. If the touch location is at the location of a screen button or where a system function or action can take place, the system will perform the action associated with the button or function. If a touch is detected at one location for more than 30 seconds, a new reference pattern is established.

10.2.4 Uninterruptible Power Supply

If the AC power input is interrupted, the computer and the touchscreen monitor will continue to receive AC power from the uninterruptible power supply (UPS) for up to 30 minutes. The UPS contains a battery and power drive circuits that will immediately begin producing AC power. A circuit breaker in the UPS will open if a problem occurs that causes the computer or monitor to draw excessive power and all AC power will be removed. The AC input to the UPS is filtered to protect the computer and monitor from damage by AC input noise, transients, and surges. The AC input also charges the battery in the UPS. When AC input power is lost, the battery powers an inverter circuit that drives a step-up transformer. The output of the transformer is at the AC line voltage level. Upon loss of AC input, power for the computer and monitor is automatically switched to AC power generated by the UPS.

10.3 RADIO-LINK DATA COMMUNICATIONS OVERVIEW

The *Oxinet II* monitoring system can communicate via radio-link using one of two methods: fixed frequency or spread spectrum. Both systems operate in the 902 to 928 MHz frequency range. If multiple *Oxinet II* systems are being used in close proximity to one another, the fixed frequency method must be selected to prevent interference between the systems.

Spread spectrum systems will “hop” to specific frequencies at specific times. A unique communication protocol is also employed to coordinate and control the communication between the central radio transceiver in the computer and up to 30 individual bedside station remote radio transceivers. The central station is programmed with the identifiers of all the remote radio transceivers in the installation.

Fixed frequency systems operate as described above with the exception of frequency hopping. One frequency per central radio transceiver is selected at setup and is used for all data transfer. There can be up to three central radio transceivers in a central station. Each *Oxinet II* fixed frequency system will have a different set of frequencies assigned for data transmission. The frequency-specific design prevents interference between adjacent *Oxinet II* systems.

When a remote radio transceiver is moved or changed, the new identification information must be entered or changed in the central station computer. The central station sends out a request for data from the remote radio transceivers. Each remote radio transceiver has an assigned time for responding after the request for data is received from the central station. When the central station is turned on, it will establish a connection with all of the remote radio transceivers. The computer will determine the frequency hop pattern for the system and determine a response time slot for each remote radio transceiver. This information is transmitted to and stored in all of the remote radio transceivers.

When a remote radio transceiver receives a request for data, it will respond with its unique identifier and send patient data collected by the bedside station monitors. If one of the hop frequencies becomes unusable, the central station will remove the frequency from the hop pattern, replace it with a new one, and reestablish the hop pattern with all the remote radio transceivers in the installation.

10.3.1 Central Radio Transceiver

At the central station, a central radio transceiver in the computer is used to communicate with all remote radio transceivers in the *Oxinet II* system installation. The central radio transceiver employs diversity reception and uses dual antenna systems for two receiver channels. A minimum of two antennas are used, one for each channel. Multiple antennas can be used with splitters for each channel to extend the operating range of the system.

10.3.2 Remote Radio Transceiver

10.3.2.1 NPB-290, NPB-295, N-395, and N-595

Each bedside station has a remote radio transceiver with a unique identification number. This number is permanently set at the factory and is printed on a label on the side of each remote radio transceiver. An AC power supply provided with the radio kit supplies power for the remote radio transceiver. Patient data collected and stored in the NPB-290, NPB-295, N-395, or N-595 is passed to the remote transceiver from the serial port on the rear of the NPB-290, NPB-295, N-395, or N-595 through a cable to the transceiver. The data is in EIA-232 format. The remote radio transceiver then transmits the patient data, monitor operating status, and alarm limit settings for display and processing at the central station.

10.3.2.2 N-3000

Each bedside station has a remote radio transceiver with a unique identification number. This number is permanently set at the factory and is printed on a label on the side of each remote radio transceiver. Power for the remote radio transceiver is supplied by the N-3000. Patient data is collected and stored in the N-3000 and an N-3100 stacked with the N-3000, and power is passed to the remote transceiver from the serial port on the rear of the N-3000 through a cable to the transceiver. The data is in EIA-232 format. The remote radio transceiver then transmits the patient data, monitor operating status, and alarm limit settings for display and processing at the central station.

10.4 HARD-WIRED SYSTEM-LEVEL BLOCK DIAGRAM ANALYSIS

For this description, refer to Figure 10-2 for a system-level block diagram of the *Oxinet II* monitoring system.

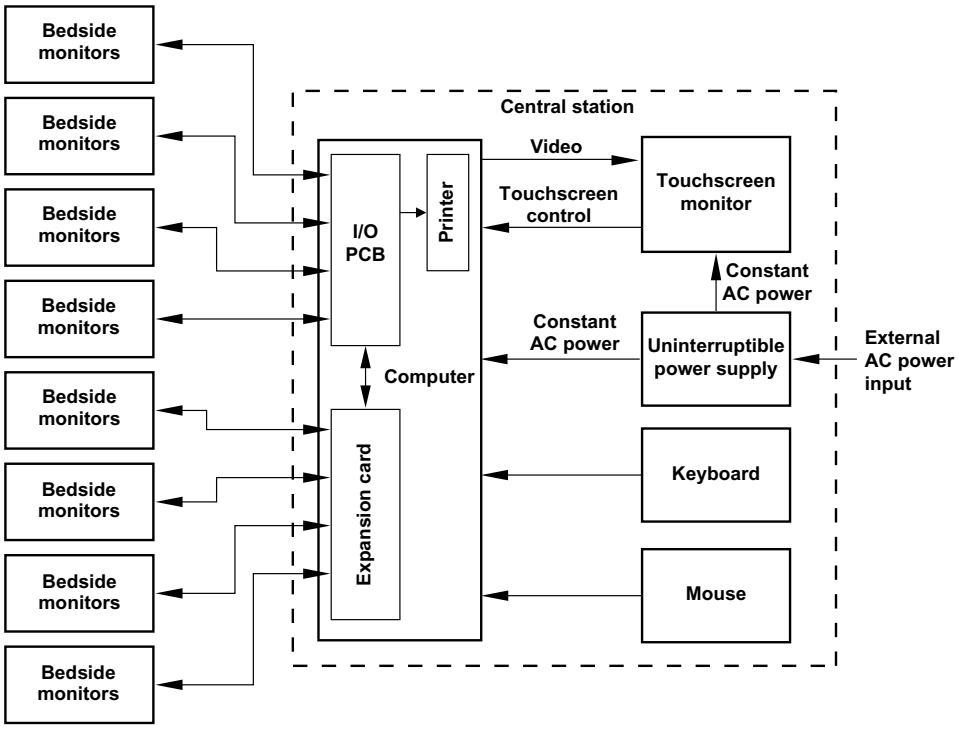

Figure 10-2: Hard-wired *Oxinet II* System-Level Block Diagram

10.4.1 Operator Interface and UPS

The operator interface for hard-wired systems is the same as for units receiving a RADIO-LINK signal, refer to paragraph 10.3 for more information. A description of the UPS can be found in paragraph 10.2.4.

10.4.2 Computer (Hard-wired Systems)

The computer is the primary component of the *Oxinet II* monitoring system. The computer is a standard personal computer and uses a 500 MHz, or faster, Pentium III-based motherboard, a hard drive, a 3.5-inch floppy drive, a video board, and a power supply. The computer also contains a touchscreen controller board that is the interface between the computer and the touchscreen modification to the monitor. The function of the touchscreen monitor and interface is described in paragraph 10.2.3, *Touchscreen Monitor*. The computer also receives operator input from a standard 101-key keyboard and a mouse.

Depending on the number of channels in the system, the computer can contain as many as two I/O PCBs and two expansion cards, which are unique to the *Oxinet II* system. Hard-wired systems can have a maximum of 16 channels for monitoring.

Each serial I/O PCB is a full-sized PC AT card that provides four channels of monitoring. The I/O PCB is responsible for sound generation and for the type of input it will recognize. If the system contains two I/O PCBs, the board with the lowest serial number is used for sound generation and to drive the thermal printer and watchdog reset, regardless of its installation position. The I/O PCB recognizes either RS-232 or RS-422 signals from the pulse oximeter. One jumper for each channel on the I/O PCB is used to determine which type of signal will be recognized. The I/O PCB supports a baud rate of 9600.

One expansion card can be added to each I/O PCB (maximum of two I/O PCBs and two expansion cards). Each expansion card provides four additional channels of monitoring. The expansion card also recognizes either RS-232 or RS-422 signals from the NPB-290, NPB-295, N-395, N-595, and N-3000 pulse oximeter. One jumper for each channel on the expansion card is used to determine which type of signal will be recognized. Signals from the NPB-290, NPB-295, N-395, N-595, and N-3000 pulse oximeter are passed through the expansion card to the I/O PCB and on to the central station for display.

Units may be equipped with an optional thermal printer. This printer is connected to the I/O PCB with the smallest serial number. The thermal printer provides digital data and a waveform printout during an alarm condition, or at the request of the operator. The waveform includes the 10-second period before and after the print initialization and the most current digital data for the patient.

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